January 1981
USA $2.95/DM 9.80

kilobaud

MICROCOMPUTING

T.M.

(DESK-TOP COMPUTERS)

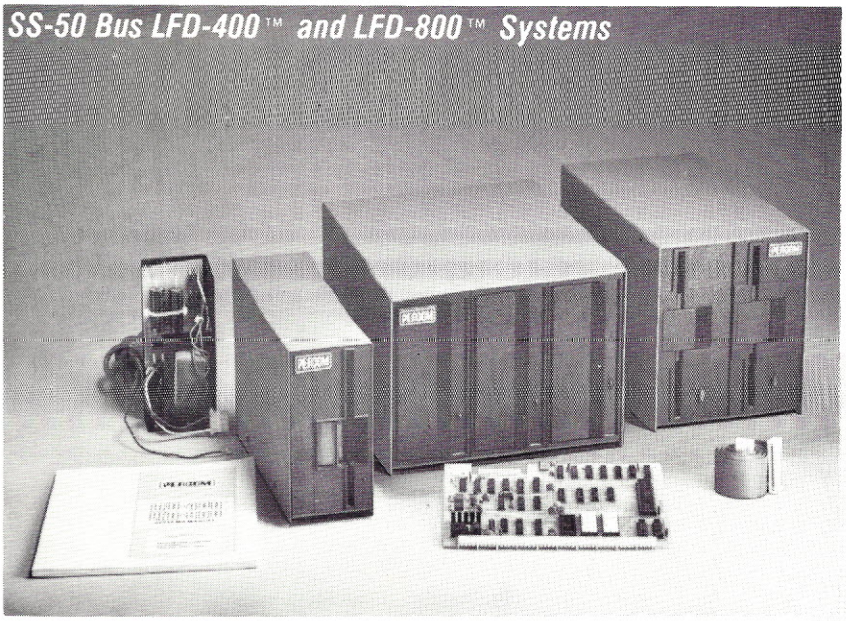
Assemble a Super Business System

Probe 16-Bit Technology

Computervans and Software Stores ☐ Enhancing H8 BASIC ☐ Apple Connections ☐ OSI Reverse Video ☐ TRS-80 in the Darkroom ☐ 6800 Accounting System ☐ Implementing File Systems ☐ PET Spectrum Analyzer

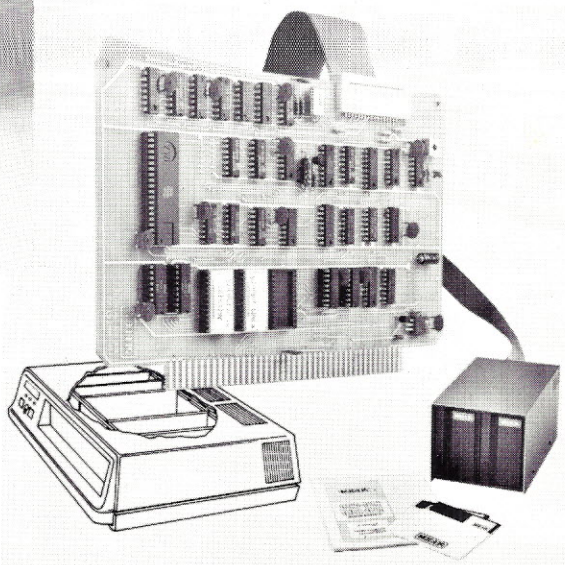
01
74470 65945

A Few Extraordinary Products for Your 6800/6809 Computer



From Percom . . .

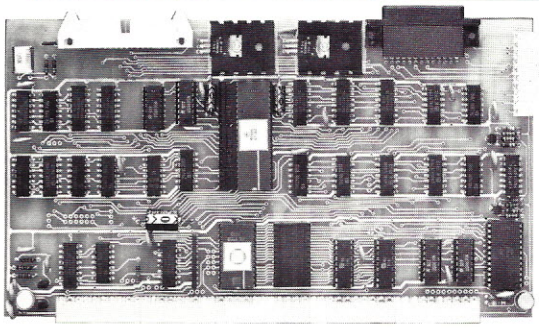
Low Cost Mini-Disk Storage in the Size You Want ↙14



EXORciser Bus LFD-400EX™ -800EX™ Systems*

Percom mini-disk systems start as low as $599.95, ready to plug in and run. You can't get better quality or a broader selection of disk software from any other microcomputer disk system manufacturer — at any price!

Features: 1-, 2- and 3-drive systems in 40- and 77-track versions store 102K- to 591K-bytes of random access data on-line • controllers include explicit clock/data separation circuit, motor inactivity time-out circuit, buffered control lines and other mature design concepts • ROM DOS included with SS-50 bus version — optional DOSs for EXORciser* bus • extra PROM sockets on-board • EXORciser* bus version has 1K-byte RAM • supported by extended disk operating systems; assemblers and other program development/debugging aids; BASIC, FORTRAN, Pascal and SPL/M languages; and, business application programs.



Versatile Mother Board, Full-Feature Prototyping Boards ↙15

Printed wiring is easily soldered tin-lead plating. Substrates are glass-epoxy. Prototyping cards provide for power regulators and distributed capacitor bypassing, accommodate 14-, 16-, 24- and 40-pin DIP sockets. Prototyping boards include bus connectors, other connectors and sockets are optional.

MOTHERBOARD — accommodates five SS-50 bus cards, and may itself be plugged into an SS-50 bus. Features wide-trace conductors. Price: $21.95

SS-50 BUS CARD — accommodates 34- and 50-pin ribbon connectors on top edge, 10-pin Molex connector on side edge. Price: $24.95.

SS-30 BUS CARD — 1¼-inch higher than SWTP I/O card, accommodates 34-pin ribbon connector and 12-pin Molex connector on top edge. Price: $14.95.

The SBC/9™. A "10" By Any Measure. ↙13

The Percom SBC/9™ is an SS-50 bus compatible, stand-alone Single-Board Computer. Configured for the 6809 microprocessor, the SBC/9™ also accommodates a 6802 without any modification. You can have state-of-the-art capability of the '09. Or put to work the enormous selection of 6800-coded programs that run on the '02.

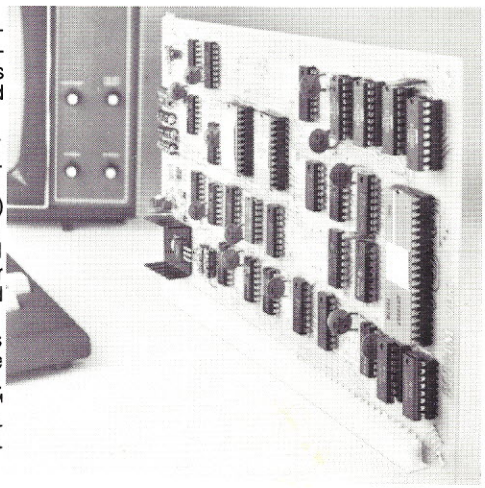
The SBC/9™ includes PSYMON™, an easily extended 1-Kbyte ROM OS. Other features include:

- Total compatibility with the SS-50 bus. Requires no changes to the motherboard, memory or I/O.
- Serial port includes bit-rate generator. RS-232-C compatible with optional subminiature 'D' connector installed. 10-pin Molex connector provided.
- Eight-bit, non-latched, bidirectional parallel port is multi-address extension of system bus. Spans a 30-address field; accommodates an exceptional variety of peripheral devices. Connector is optional.
- Includes 1-Kbyte of static RAM.
- Costs only $199.95 with PSYMON™ and comprehensive users manual that includes source listing of PSYMON™.

The Electric Window™: Instant, Real-Time Video Display Control ↙16

Memory residency and outstanding software control of display format and characters make this SS-50 bus VDC card an exceptional value at only $249.95. Other features:

- Generates 128 characters including all ASCII displayable characters plus selected Greek letters and other special symbols.
- Well-formed, easy-to-read 7x12-dot characters. True baseline descenders.
- Character-store (display) memory included on card.
- Provision for optional character generator EPROM for user defined symbols.
- Comprehensive users manual includes source listing of Driver software. Driver — called WINDEX™ — is also available on mini-diskette through the Percom Users Group.



™ trademark of Percom Data Company, Inc.
* trademark of the Motorola Corporation.
Prices and specifications subject to change without notice.

INTRODUCING THE EMULATOR™

The trouble with video terminals today is that most of the low-cost models just don't have the performance to handle your tough applications. And the few that do are usually not compatible with your existing system. But now, Intertec has resolved this age old dilemma with the introduction of its new Emulator™ Video Terminal.

The $895* Emulator™ performs exactly as you command. With the depression of just a few keys, Emulator users can select terminal control codes of any one of four popular video terminals. The Lear-Siegler ADM-3A. The Soroc 1Q-120. The DEC VT-52. Or the Hazeltine 1500. Incredible! It's like having four terminals for the price of one.

But, best of all, not only does the Emulator replace these terminals, it outperforms them by offering enhanced user-oriented features. Features that those other terminals just don't have - at any price.

Standard Emulator™ features include: a sharp, crisp 12" non-glare screen with a full 24 line by 80 column display. Twin RS232C serial ports - one for the host computer and one for your printer. Four separate cursor control keys. A separate 18 key numeric pad. Keyboard selectable baud rates and operating modes. And, a host of visual attributes.

No matter which dumb or smart terminal you're using today, don't buy another until you check out our new Emulator™. You'll get the performance of four terminals for the price of one. And you'll probably save hundreds of dollars over the price you paid for your last terminal. Plus, you'll get unparalleled reliability, nationwide service and quick delivery. Call or write us today for all the details. Intertec terminals are distributed worldwide and may be available in your area now.

INTERTEC DATA SYSTEMS®

343

2300 Broad River Rd, Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115



*Quantity one - Dealer inquiries invited.

MICROCOMPUTING

PUBLISHER/EDITOR
Wayne Green
EXECUTIVE VICE PRESIDENT
Sherry Smythe
EDITORIAL MANAGER
Jeff DeTray
PUBLICATIONS MANAGER
Edward Ferman
MANAGING EDITOR
Dennis Brisson
ASST. MANAGING EDITOR
Susan Gross
COPY EDITOR
Eric Maloney
EDITORIAL ASSISTANT
Linda Stephenson
ADMINISTRATIVE ASSISTANTS
Cresca Clyne, Pat Graham, Nancy Noyd
ASSOCIATE EDITORS
Robert Baker, Ken Barbier, Frank Derfler, Jr., Rod Hallen, Peter Stark, Sherm Wantz

MANUFACTURING MANAGER
Noel Self
PRODUCTION MANAGER/PUBLICATIONS
Nancy Salmon
ASST. PRODUCTION MANAGER
Michael Murphy
ART DIRECTOR
Diana Shonk
PRODUCTION DEPARTMENT
Joan Ahern, William Anderson, Jr., Steve Baldwin, Linda Drew, Robert Drew, Bob Dukette, Bruce Hedin, Kenneth Jackson, Ross Kenyon, Maryann Metivier, Theresa Ostebo, Jane Preston, Dion Owens, Patrice Scribner, Susan Symonds, Thomas Villeneuve
PHOTOGRAPHY
William Heydolph, Terrie Anderson, Bill Suttenfield
TYPESETTING
Barbara Latti, Sara Bedell, Michele DesRochers, Luann Keddy, Mary Kinzel, Linda Locke, Karen Podzycki

CORPORATE CONTROLLER
Charles Garniss, Jr
PLANT MANAGER
Leatrice O'Neil
ACCOUNTING MANAGER
Knud Keller
CIRCULATION MANAGER
Debra Boudrieau
CIRCULATION
Doris Day, Pauline Johnstone
BULK SALES MANAGER
Ginnie Boudrieau
PUBLIC RELATIONS
Joseph Wilson
ADVERTISING
603-924-7138
Kevin Rushalko, Mgr.
Marcia Stone, Hal Stephens

BUSINESS

29 Assemble a Super Business System Dr. Tom Lukers
Sixteen bits on the S-100 bus.

106 On the Road with a TRS-80 Ronald H. Bobo — TRS-80
Computervans and Software Stores.

135 A Minimum Accounting System Gene Embry — 6800
Keeps the books balanced and information easily accessible.

DATA COMMUNICATIONS

192 Modem Control
For the Hayes Micromodem 100 or 80-103A.

EDUCATION

95 The Microprocessor as Tutor Ken Reid
Meet the campus hero at the University of Louisville.

GAMES

78 Scramble Edward Rager — Commodore PET
Anagrammatize with your PET.

126 Space Race Robert M. Hirbernik — Apple II
Journey to the world of Apple II color graphics.

GENERAL

43 Managing the Small System Environment Steve Roberts
Organization is the key.

200 Finishing School for Programmers David C. Goodfellow
Instant Software makes them shine.

HARDWARE MODIFICATIONS

122 Apple Connections Rolf A. Deininger and Don Tujaka — Apple
Make peripheral connections quick and easy.

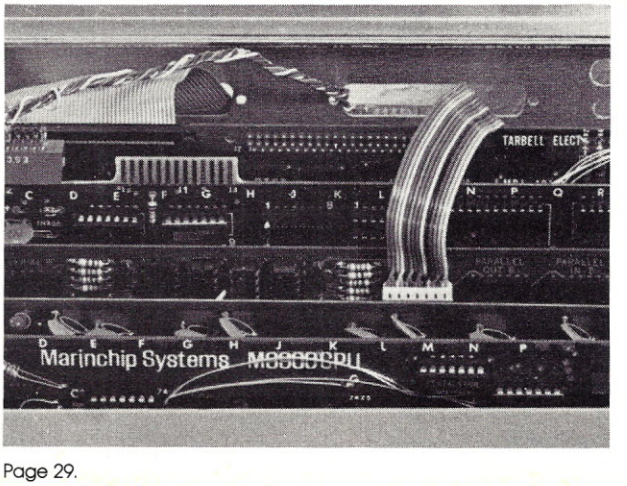
176 Reverse Video for the OSI C1P Donn Burke Baker — OSI
A black-and-white modification.

188 Second Cassette Interface with One IC Thomas E. Hutchinson — PET
When one tape recorder for the PET isn't enough.

MUSIC

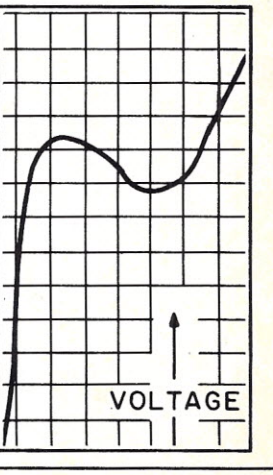
53 Simulation of Musical Instruments Hal Chamberlin
Sound generation in a DAC-based system.

60 Computer Music the Easy Way Steve Marum
Software for the SN76489A sound chip.



Page 29.

Page 53.



Contents: January 1981

Volume V
No. 1

REVIEWS

Commodore PET — Robert Baker **Real-Time Spectrum Analyzer** 48
Audio signal analysis for your PET.

H. W. Neff **6801: A One-Chip System** 100
Eight-bit addition to the M6800 family.

North Star — Dr. G. L. Haller **Word Processor for the North Star Disk System** 164
This Secretary has shapely modes.

SOFTWARE

North Star — Rinaldo F. Prisco **Blank Removal** 40
Tighten up North Star programs.

TRS-80 — David Busch **TRS-80 in the Darkroom** 118
Photo processing with a micro.

Heath — Edgar C. Howell **Enhancing H8 BASIC** 130
Simple interface between H8 user subroutines and BASIC.

CP/M — Jon Lindsay **For CP/M: Automatic Program Execution on Start-Up** 184
Save time and keystrokes.

TUTORIAL

6800 — Peter A. Stark **The SWTP Computer System** 82
A look at video and bulletin boards and hardware and software mods.

Richard Fritzson **Data on Disk** 111
Implementing file systems.

6800 — Peter A. Stark **Kilobaud Klassroom No. 24** 168
Connecting to the outside world.

DEPARTMENTS

Publisher's Remarks–6
PET-pourri–10
Computer Blackboard–14
Dial-up Directory–16
As the Word Turns–19
Micro-Scope–20
Micro Quiz–23
Letters to the Editor–24
Calendar–202
Corrections–202
Dealer Directory–203
Classifieds–204
New Products–228
New Software–234
Computer Clinic–237
Book Reviews–238
Perspectives–242

This month:

In the four years since the inception of **Kilobaud Microcomputing**, the nature of the microcomputer magazine audience has changed significantly. The hardware-oriented hobbyist of 1977 has been superseded by the businessman, educator and scientist of 1981. Also, as the hardware has become increasingly reliable, there has been a growing realization that software is the key to the future growth of the industry.

We have begun to address this new audience with articles and special issues devoted to their needs. Business/professional articles are flagged with a unique identifier. Last June saw an issue devoted to the educational uses of microcomputers. Issues emphasizing word processing and data communications are among those planned for this year. Our shift in direction is a gradual one (indeed, we will always have a place in the magazine for the hardware tinkerer and homebrew hacker, who has been with us from the beginning and remains with us).

As we begin our fifth year of operation, the magazine will take on a new look in format, as well as content. New type styles, layouts and design ideas have been introduced to bring you a more readable and enjoyable magazine. And to keep you abreast of the happenings in this rapidly changing field, we have introduced several new features, which will appear regularly each month, and have beefed up our regular columns.

We hope you find that these changes (some are subtle; some are very blunt) live up to the quality you have come to expect from this magazine in just its few short years. As always, any ideas, suggestions or constructive criticisms are welcome. Let's keep the lines open.

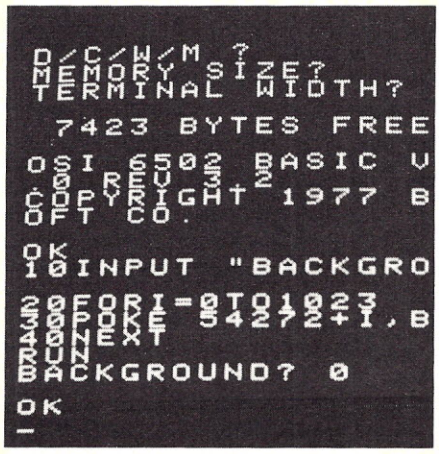
–The Editors

This month's cover:

The Marinchip Systems M9900 CPU board, which forms the basis of our 16-bit "Super Business System" cover story (p. 29). Photo by Martin Paul.

Page 106.



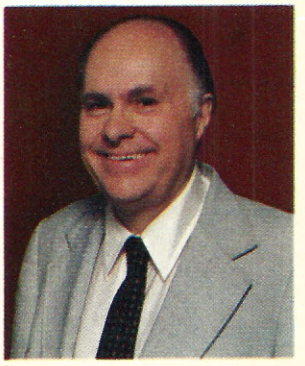


Page 176.

Kilobaud *Microcomputing* (ISSN 0192-4575) is published monthly by Wayne Green, Inc., 80 Pine St., Peterborough NH 03458. Subscription rates in U.S. are $25 for one year and $53 for three years. In Canada: $27 for one year only, U.S. funds. Foreign subscriptions (surface mail)—$35 for one year only, U.S. funds. Foreign air mail subscriptions—$62 for one year only, U.S. funds. Canadian Distributor: Micron Distributing, 409 Queen St. West, Toronto, Ontario, Canada M5V 2A5. In Europe, contact: Monika Nedela, Markstr. 3, D-7778 Markdorf, W. Germany. South African Distributor: KB Microcomputing, PO Box 782815, Sandton, South Africa 2146. Australian Distributor: Electronic Concepts, Attention: Rudi Hoess, 55 Clarence Street, Sidney 2000, Australia. Second-class postage paid at Peterborough NH 03458 and at additional mailing offices. Phone: 603-924-3873. Entire contents copyright 1980 by Wayne Green, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

Wayne Green

East Headed West



The Asian Threat

The American manufacturers of microcomputer equipment have pretty much had it their own way ever since the industry got started in 1975. Even in Europe the American products have been the best sellers. Up until fairly recently this was also true in Japan and most of Asia—but that is changing.

The money and pressures for miniaturization in the space race of a few years back brought on our development of microelectronics. The microprocessor was the result of this evolution, making possible the microcomputer. From there, the demands of our 200-million-strong population and its relatively high, displosive income fanned the flames, bringing a myriad of poorly organized firms into business to satisfy this market.

The Japanese, not being entrants in the space race, let us spend our billions of dollars developing LSI chips, then they stepped in. Unlike the U.S., which has had virtually no increase in the number of electronic engineer graduates in the last 17 years, Japan has had a substantial growth, and they are far ahead of us in the number of both engineers and technicians. This shows when it comes to developing consumer products.

While more and more of the Japanese-designed products are being made in such places as Korea, Taiwan, Hong Kong, Singapore and the Philippines, the new technology is most definitely coming from Japan. In the microcomputer field this means that while Japan got started a couple years late, now they are moving ahead like a steamroller, and many smaller U.S. firms are in a position to get crushed.

A year ago, when I visited Japan, one of the best-selling microcomputers was the Apple. On my latest trip I rarely saw one, and was told by several of the larger dealers that Apple sales in Japan are no longer significant due to the competition from new Japanese systems.

In America, the major well-known firm making systems is Radio Shack—and perhaps Texas Instruments could be counted in there, though they do not yet seem to have found a way to really market their product. In Japan everyone is in the act. There are excellent micros being marketed by Casio, Hitachi, Sanyo, Seiko, NEC, Sharp, Toshiba and so on. The scary part for us is that most of these firms have their eye on the fast-growing and almost unlimited American market.

Already announced as entrants in the U.S. are Panasonic, Quasar, Casio, NEC, Sord and Sharp. I have good reason to believe that Toshiba, Hitachi, Sanyo and others will be here shortly, once they figure out how best to market their systems in the U.S.

Can the Japanese design better microcomputers than we? Since they are head and shoulders above us on the design of most electronic equipment today, the reasonable answer is yes. In looking over the latest electronic equipment, I am hard put to find American products which are as innovative as those from Japan. Just looking around at the gadgets I've picked up recently gives me a good indication. I try to keep abreast of consumer electronics technology and familiarize myself with new developments.

On my wrist is a Casio C-80 calculator watch. It is so good, in my estimation, and so incredibly inexpensive, that I wonder if any other watch firms are going to survive. I do have a second watch—for skin diving—and it's another new, inexpensive Casio. On my desk are a Sony (M-400B) microrecorder, which has paid for itself several times over already; a new Sony TCS-300 stereo minirecorder, which is invaluable for recording talks and meetings; a Casio Melody-90 calculator; and a Sharp Memowriter (EL-7000). In my desk drawers are older calculators such as the Casio ML-80, MQ-1, MQ-2 and CQ-1. I keep a tiny Sanyo portable TV handy, and Sherry is hardly ever without her Sharp Pocket Computer and microrecorder for programs and data.

Until such time as we figure out how to attract more people to engineering and technician work, I think we are going to have to try to accept Japan leading us in electronic technology—certainly on a consumer electronics products level. I think that we are going to see an increasing number of Japanese microcomputers coming into our country, and, unless something goes wrong with their system (which hasn't failed them recently), they will be able to gradually push many of the American firms out of business.

I should add a caveat. The above takes for granted that neither the U.S. nor the Japanese firms will decide to do anything serious about software. Since no U.S. firm has as yet, nor have I seen any glimmer of hope that any will, it is possible that the Japanese will be as blind to this aspect of selling computers as the U.S. firms. If so, the hardware will sell largely on the basis of its excellent design. Unless our experiences in ham gear, in hi-fi equipment, in auto sound, in calculators, in video cameras, in video recorders, in cassette records, in CB equipment, and on down the line are unique, they have a good chance to take over still another of our high-technology industries. Did I forget to mention TV sets and transistor radios?

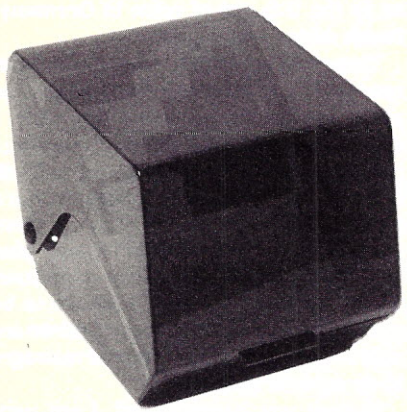
Certainly, one good look at the current crop of Japanese microcomputers is not likely to instill confidence in our American products. Well, you may ask, what about the new Radio Shack TRS-80PC? That's certainly innovative and indicative of what *can* be done. Right, and it comes from Sharp in Japan. Sherry bought one in Tokyo, and it *is* a darned good product. Perhaps the American firms will be able to cope with the Japanese talents by merely doing the American marketing of the products.

Speaking of the PC, I'd like to make sure that readers who have one of those or the Sharp version are well aware that I'm looking for articles and programs on it. That big fat book of programs they sell with the computer is a rip-off. What a bunch of useless programs! One of the

META TECHNOLOGIES
FOR YOUR DISK SYSTEM

FILE BOX
DISKETTE STORAGE SYSTEM

$24.95 for 5¼" disks
for 8" disks . . . $29.95



MTC brings you the ULTIMATE diskette storage system, at an affordable price. Storing 50 to 60 diskettes, this durable, smoke-colored acrylic unit provides easy access through the use of index dividers and adjustable tabs. Unique lid design provides dust-free protection and doubles as a carrying handle.

PLASTIC LIBRARY CASES
(not shown)

An economical form of storage for 10 to 15 diskettes, and is suitable for your bookshelf! Case opens into a vertical holder for easy access.

5¼-inch diskette case $3.25
8-inch diskette case $3.50

Single Sided, Single Density, Soft-Sectored 5¼-inch, (for TRS-80™) Mini-floppy

DISKETTES

$21.95 box of 10

Meta Technologies strikes again . . . at the competition! These are factory fresh, absolutely first quality (no seconds!) mini-floppies. They are complete with envelopes, labels and write-protect tabs in a shrink-wrapped box.

PLAIN JANE™
DISKETTES
The Beautiful Floppy with the Magnetic Personality™

In 1980 alone, MTC has sold nearly a third of a million dollars worth of brand-name diskettes. If anyone knows quality, we do. And these are quality diskettes. The catch? They are in a plain white box. You're not paying for fancy printing, fancy labels or fancy names on the packaging. We don't even put our own label on the package (labels cost money). In the last two months thousands of people have switched to this low-cost alternative. Trust us.

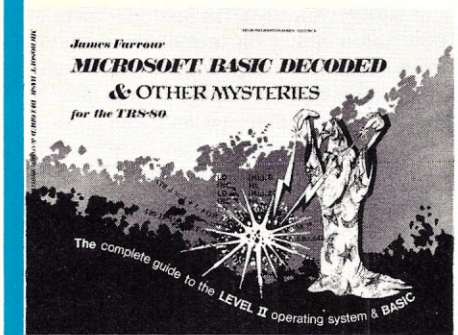
PLAIN JANE™ Diskettes . . . . . $ 21.95

VERBATIM brand Diskettes (box of 10)

5¼-inch (for TRS-80™)
MD525-01 . . . . . $24.95
10 boxes of 10. . . (each box). . . $23.95

8-inch FLOPPIES
Single-Density, FD34-1000 . . . $29.95
Double-Density, FD34-8000 . . $39.95

TRS-80™ PRODUCTS



NEWDOS/80 by Apparat $149.95
NEWDOS+ with ALL UTILITIES
35-track $69.95
40-track $79.95
TRS-80™ DISK AND OTHER MYSTERIES . . . $19.95
MICROSOFT ™ BASIC DECODED & OTHER MYSTERIES for the TRS-80™. $29.95

'RINGS' & THINGS

Help prevent data loss and media damage due to improper diskette centering and rotation with the FLOPPY SAVER™ reinforcing hub ring kit. 7-mil mylar rings install in seconds. Kit is complete with centering tool, pressure ring, 25 adhesive backed hub rings and instructions. Refills available.
HUB RING KIT for 5¼" diskettes . . $9.95

Protect your expensive disk drives and your valuable diskettes with our diskette drive head cleaning kit. The kit, consisting of a pair of special "diskettes", cleaning solution and instructions, can be used for 52 cleanings. Removes contamination from recording surfaces in seconds without harming drives.
HEAD CLEANING KIT for 5¼" drives $24.95

CALL FOR INFORMATION ON OTHER TRS-80™ PRODUCTS

Products damaged in transit will be exchanged. Prices, Specifications, and Offerings subject to change without notice.

MOST ORDERS SHIPPED WITHIN ONE BUSINESS DAY

PRICES IN EFFECT January 1, 1981 THRU January 31, 1981

WE ACCEPT
- VISA
- MASTER CHARGE
- CHECKS
- MONEY ORDERS
- C.O.D.

- Add $2.50 for standard UPS shipping & handling
- $2.00 EXTRA for C.O.D.
- Ohio residents add 5½% sales tax.

TO PLACE ORDER 1-800-321-3552
CALL TOLL FREE
FOR PRODUCT INFO 1-800-321-3640
IN OHIO call (216)289-7500 (COLLECT)

master charge
VISA

META TECHNOLOGIES CORPORATION
✓161 26111 Brush Avenue. Euclid. Ohio 44132

801114
TRS-80 is a TM of Tandy Corp.
PLAIN JANE is a TM of MTC.
©1980 by Metatechnologies Corporation, Inc.

✓ Reader Service—see page 226

first things we need is a way to interface that contraption to some more memory. The Quasar prototype, which was shown at CES in Chicago last summer, looked incredibly like the Sharp unit, and it had extra memory available to plug in. It also had a modem and even a small printer. I think that the Sharp Memowriter might interface with the Sharp computer to provide a printout. Any experimenters out there?

Unless something changes in the area of software support for one of the American systems, I'd say that events should favor a gradual take-over by the Japanese. This means that stock in American microcomputer firms could turn into a time bomb, with the Japanese lighting the fuse. Should any of the Japanese firms solve the software problem before the U.S. firms, their entry could be made substantially simpler and millions of dollars less expensive.

Another event is happening in Japan which could have long-range effects on our microcomputer industry: the Japanese advances in video disk technology. Some of these techniques are remarkably similar to computer disk technology, and again Japan is way out in front. This could raise hell with our disk firms, should some of the laser writing ideas pan out.

Japan's edge over us has nothing to do with cheap foreign labor at all, for the Japanese auto workers make about what our average wage earners do. The problem for Detroit is that the auto union workers earn double the average American wage, and all of us have had to subsidize this when buying American cars.

Oh, many of the Japanese plants are far more efficient than ours, but this has more to do with our union restrictions than further blindness on the part of auto makers. The Asians figured out some time ago that they would not be able to continue to compete with us on the basis of low wages forever, so they have automated in every possible way to keep down the cost of production.

In Korea, where wage scales are still quite low, I recently visited a color television set factory and saw one of the most modern automated electronic plants I've ever seen. The hand labor there is absolutely minimized, contributing less than $2.50 to the cost of the set. Even if their wages double, they will still be very competitive with any other country.

In addition to the above-average wages for U.S. electronic workers, astronomical wage scales are enjoyed by our few technicians and engineers. We will find ourselves paying the price in the long run.

The prosperity in Silicon Valley was fed by open-ended government contracts in which firms hired people for almost any going wage and used them for a specific contract. Once the contracts were completed, the people would move across the street at an even higher wage to help the next firm with a contract. This encouraged the escalation of salaries all out of proportion to the benefit of the companies designing products—all fed by unlimited government funds. It also encouraged engineers and technicians to jump from one firm to another, chasing ever higher wages.

The Asians don't work like this. Their wages are much more modest, and they stick with a company through thick and thin. This results in far lower costs of training and retraining workers, and the bottom line is the better products which result and the far lower cost of their development.

Thus, in the long run, it seems likely that unless there are some major changes in the way our firms do things, ever-increasing infusions of capital will be needed to keep them afloat in competition with the Japanese. . . and then with the Koreans, Taiwanese, and so forth. We have already seen a couple of systems—the APF and the Video Genie (also known as the TRZ-80 and now the PMC-80)—popping up from Hong Kong. The indications are that Hong Kong has again leaned heavily on foreign R&D, getting into business primarily on the basis of low-cost manufacture.

If the future looks bleak for the smaller makers of microcomputers as a result of the invasion from Asia, what about our two or three major manufacturers? Surely they are in a reasonably impenetrable situation. They have a good head start, they have their sales and service organizations set up and running, they have two or three years of advertising and a whole lot of customers for a customer base. It does look at first glance as though these firms may be on safe footing.

But we've seen the mightiest of them fall in the past. Mits seemed in a position which was really unchallengeable. They were followed by a string of other firms, each appearing to be leaders and on solid ground. Will it be possible for the Japanese to cut into Radio Shack, with their 7000 stores, just on the basis of improved technology and advertising? Well, we'll see.

Instant Software in Asia?

In addition to tending to substantially improved distribution and sales in Australia and New Zealand, plus growing markets in Singapore and Hong Kong, I had to do some follow-up work on our incursion into Korea and Japan. There is now a TRS-80 Korean ROM, so we will be getting to work on translations of our programs into that language. There is a possibility that we'll be organizing a Korean language version of *Microcomputing* too.

My few days in Japan were packed with meetings with firms interested in working on a trading partnership basis, so the prospects for growth there are excellent. This will be important for the long-range future of Instant Software, because we want to be able to draw upon the work of free-lance programmers anywhere in the world and distribute their programs everywhere, in many languages and adapted to whatever computer systems are viable.

With the U.S. programmers a year or two ahead of the Japanese, we have a decided advantage in producing programs for use in Japan. There are, of course, some cultural and business differences, but for the most part the programs of value in the U.S. are of value in Germany, South Africa and Japan.

There will be another tour of the Asian consumer electronics shows in 1981, so perhaps you can get away this time. I don't know if I'll have the time to spare; I just have too many things going on. I will have to visit our Japanese partners, but a couple days won't hack it. With our opening of a production plant in Ireland, plus developing rep organizations or partnerships in many countries, I'll have to be getting around a lot—at least until we are able to find or develop a general manager to do some of this work.

In case you haven't read, I am very much in need of some help—not only with the publications and books, but in Instant Software. I need technicians, programmers and people with management experience.

If you are interested in further information about going on one of these show tours, watch for more dope in this magazine. Whether I'm along or not won't make a lot of difference, as those on this year's trip discovered. I'm hardly ever available, being rushed from one business meeting to another and giving talks. Sherry and I missed the bulk of the group lunches and dinners on this last trip. We were just kept too busy with meetings and talks.

The most intriguing part of our trip was the few days we spent in Canton, China. Ten tour members went there and had the experience of a lifetime. We all agreed as we returned that we would not have missed it for anything, and that we were very unlikely to go to China again. I'll try to tell you more about it in a later editorial.

JS&A

In the December issue I took JS&A to task for the ROM work on their chess program. I've since received an explanation that they depended upon a Hong Kong supplier, and therein lay much of their problems. Knowing all too well how things work in Hong Kong, I can understand why JS&A might have gotten into some difficulty.

Hong Kong is the land of the rip-off, though the term in their context may have a slightly different meaning than

you may be used to. In this case, it has to do with imitation rather than theft, though the line can be a fine one at times. For example, when Sony came out with their Walkman stereo cassette player, it didn't take the Hong Kong merchants long to come out with a lower-cost copy, much as designer dresses are "ripped off" by the production of bargain copies.

Hong Kong, having very few radio amateurs and therefore a very small supply of engineers and technicians, has to depend upon the brains of other countries for their new products. Their large supply of relatively low-wage help allows them to take the designs and inventions of others and produce them for sale at a lower cost. The drawback is that they are always about a year behind the higher-technology firms. Another drawback is that Hong Kong does not have a governmentally supported program to assure high quality of exports, so you take your chances when you buy a Hong Kong product. There are few known name products from that country. Caveat emptor is the phrase.

Before WWII, Japan was famous for low-cost imitations. Indeed, if something was Japanese, you could be fairly sure that it was of poor quality. The same was true of China at the time. They were noted for cheap, shoddy junk. Today Japan has an image of quality, while products from Hong Kong are suspect.

The lower wages of Hong Kong have encouraged many of the Japanese firms to set up production in the colony. Many American firms, for example, APF, are also doing this. APF is an American firm whose computer is made in Hong Kong.

A visit to Hong Kong is exciting. It is a truly capitalistic country, run primarily by businessmen. Thus, you see few signs of poverty—there are just too many jobs available for anyone to go hungry. The signs indicate wealth. You see more expensive Mercedes cars per block there than anywhere else in the world.

The prices for food are not a lot higher than in the U.S., and they even have a couple McDonald restaurants to satisfy those Big Mac attacks. The city is made up largely of high-rise buildings, which are needed in the limited acreage of the country to house the millions of refugees from China and Viet Nam. The international airport is downtown, since that is about the only flat spot in Hong Kong. The colony is surrounded by China and is dependent upon it for its survival. There is some question as to what may happen in 1999, when the lease on the colony is up. Today China depends a lot on Hong Kong as a bridge to the rest of the world, but if China should really open up, they might not need the colony in ten or 20 years—and the land could return to the control of China. This is an unsettling thought, covered over by brave mutual assurances by the people living there that surely China won't want to upset things. Maybe.

Since business in Hong Kong has been thriving on the brains of others, so to speak, I can easily picture how JS&A got into a problem with their chess game from Hong Kong. Apparently, the chess program involved was on a ROM, and I believe that JS&A had been assured that everything was in order. It turned out that the ROM was copied, and the original owner sued. The first court ruled in JS&A's favor, but on the vague grounds that since the program was not actually in writing, it was not copyright protected. An appeals court again found for JS&A, but on entirely different grounds. The appeals court upheld the copyright protection of programs, whether on ROMs, tapes, disks or whatever. They ruled in favor of JS&A on the basis that the copyright notice was not marked on the ROM. JS&A won, but it was a close one—and you might say it was on a technicality.

Any remarks I've made about the ethics of the situation should be reconsidered in the light of how much JS&A people knew or didn't know about the ownership of the disputed program. I believe Joe Sugarman when he says that he was an innocent bystander in this Hong Kong rip-off. However, I do suspect that he should plead gullible if he trusted the Hong Kong merchants about this. Reason should have told him that Hong Kong has no programmers capable of writing such a program.

Microcomputing Graphic Arts Contest

We know that many of you have been experimenting with computer graphics. So we decided that it is time for you to show us—and your fellow microcomputerists—what you've been up to, with our first *Microcomputing* Graphic Arts Contest. No matter what kind of microcomputer you own, you'll have the opportunity to demonstrate your creativity, imagination and programming skill.

You have four categories to choose from: color video, black and white video, printer hard copy and plotter hard copy. We'll be awarding three prizes in each category: $100 for first prize, a $50 certificate toward the purchase of books from our Book Nook for second prize and a one-year subscription to *Microcomputing* magazine for third prize. We'll also be handing out honorable mentions, and all prize-winning entries will have the chance to appear in the pages of our July issue.

Here are the details:

1. Submit entries in any of the four categories mentioned above: color video, black and white video, printer hard copy and plotter hard copy. Limit: two submissions per category, in as many categories as you like.

2. Submit with *each* entry a card with the following information: Your name, address and phone number; the category of the entry; the title of the entry; a description of the hardware; and the name of any commercial software used in the creation of your work.

3. For the black and white and color video categories, submit glossy prints of the artwork as it appears on your video display. Photos must be at least 5 × 7 inches.

4. For the printer and plotter categories, submit full-size originals of the work. Entries may be any size.

5. While you don't need to submit programs with your entries, they must be available on request.

6. Naturally, we will accept only those graphics generated on a microcomputer. No minis or mainframes are allowed.

7. Entries must be postmarked no later than April 1, 1981. All judges' decisions will be final. All entries become the property of *Microcomputing* magazine, and cannot be returned. Employees of Wayne Green, Inc., are not eligible.

8. Address entries to Graphic Arts Contest, *Microcomputing* Editorial, Peterborough, NH 03458.

9. All winning entries will be eligible to appear in the July 1981 issue. Who knows: one might even appear on the cover!

One final note. Don't be intimidated if you don't have the latest in fancy equipment. Your creativity and imagination are far more important than the sophistication of your hardware. Remember: a few simple strokes can often express what a thousand cannot.

Articles Wanted

Please keep in mind that I am looking for articles written for businessmen which will tell them what a particular microcomputer has done in a business application. The articles should be written in English and cover everything a businessman wants to know—why the equipment was selected, where the programs came from, how the whole project worked and future plans.

Ditto for school applications for microcomputers. There are thousands of schools which are vitally interested in finding out what is known about the costs and benefits of introducing microcomputers into schools, what can be done with them and what the problems are.

By Robert W. Baker

New PET Monitor

Monjana/1 from Elcomp

Monjana/1

The Commodore monitor provides all the necessary features to examine and modify memory locations or register values, save and load areas of memory, set break points, and so on. However, it lacks several features that could be very useful when debugging machine-language programs.

For instance, there are no disassembler, relocating or tracing facilities, not to mention single-step tracing. Also, there is no real printer support, even though it can be provided by BASIC in a roundabout way. To get printed copies of the output from the Commodore monitor, you first have to issue OPEN 4,4 : CMD 4 BASIC commands in immediate mode before entering the monitor. To turn the printer off, you have to return to BASIC and issue a CLOSE 4 command.

Elcomp Publishing currently offers a well-documented monitor ROM, called Monjana/1, that is an improved version of its earlier Jana monitor for the original 8K PET. The 2K ROM occupies hexadecimal locations $9000 to $97FF using socket UD3 (the right-most unused socket). Unfortunately, this is the same ROM socket used by several other products, but you can always use a ROM switch such as Spacemaker. Monjana/1 user commands provide a number of useful functions for anyone working with machine-language programs:

M = Memory dump. A specified area of memory, between starting and ending addresses, is displayed in a condensed form much like the Commodore monitor. Each display line indicates the hex value of eight consecutive bytes of memory. See Listing 1.

W = Write. Using the W command, you can change or move in memory data edited by an M command.

D = Disassemble. This command is the basis for several more powerful features of the Monjana/1. It displays one machine instruction per line both in hexadecimal and mnemonic code. See the sample in Listing 2.

I = Instruction modification. Using the I command, you can optionally change instructions edited by a D command.

F = Feed. The function of the F command is nearly the same as that of the I command, except that sequential instructions can be entered much easier with automatic sequencing of the cursor and location counter.

T = Trace. Traces program execution, displaying the program counter, registers and stack pointer.

E = Execute. This command executes a single instruction while allowing modification of the program counter, registers or stack pointer. See Listing 3.

J = Jump. This command starts execution of a program at the machine instruction indicated by the current value of the program counter. Execution continues until the first BRK instruction is encountered and control is returned to the monitor. This command is identical to the Commodore G (GO) command.

R = Relocate. Transfers data from one area of memory to another unchanged. The area to be moved is limited by starting and ending addresses, while the starting address is sufficient for the target area. See Listing 4.

```
M:033A-03A2   0  1  2  3  4  5  6  7
W:033A-0341  A5 28 85 1F 85 21 A5 29
W:0342-0349  85 20 85 22 A0 01 B1 1F
W:034A-0351  D0 09 20 95 03 20 95 03
W:0352-0359  4C 39 C4 A2 04 20 95 03
W:035A-0361  CA D0 FA 20 88 03 F0 1A
W:0362-0369  C9 20 F0 F7 C9 8F D0 05
W:036A-0371  20 85 03 D0 FB C9 22 D0
W:0372-0379  09 20 85 03 F0 04 C9 22
W:037A-0381  D0 F7 20 98 03 C9 00 D0
W:0382-0389  DA F0 C1 20 98 03 A0 00
W:038A-0391  B1 1F E6 1F D0 02 E6 20
W:0392-0399  C9 00 60 20 88 03 91 21
W:039A-03A1  E6 21 D0 02 E6 22 60 FF
W:03A2-03A9  00 FF 00 FF 00 FF 00 FF
```

Listing 1. Monjana/1 sample memory dump.

```
D:033A-03A2   1  2  3   MNC-CODE
I:033A       A5 28      LDA $28
I:033C       85 1F      STA $1F
I:033E       85 21      STA $21
I:0340       A5 29      LDA $29
I:0342       85 20      STA $20
I:0344       85 22      STA $22
I:0346       A0 01      LDY =$01
I:0348       B1 1F      LDA ($1F),
I:034A       D0 09      BNE $0355
I:034C       20 95 03   JSR $0395
I:034F       20 95 03   JSR $0395
I:0352       4C 39 C4   JMP $C439
I:0355       A2 04      LDX =$04
I:0357       20 95 03   JSR $0395
I:035A       CA         DEX
I:035B       D0 FA      BNE $0357
I:035D       20 88 03   JSR $0388
I:0360       F0 1A      BEQ $037C
I:0362       C9 20      CMP =$20
I:0364       F0 F7      BEQ $035D
I:0366       C9 8F      CMP =$8F
I:0368       D0 05      BNE $036F
I:036A       20 85 03   JSR $0385
I:036D       D0 FB      BNE $036A
I:036F       C9 22      CMP =$22
I:0371       D0 09      BNE $037C
I:0373       20 85 03   JSR $0385
I:0376       F0 04      BEQ $037C
I:0378       C9 22      CMP =$22
I:037A       D0 F7      BNE $0373
I:037C       20 98 03   JSR $0398
I:037F       C9 00      CMP =$00
I:0381       D0 DA      BNE $035D
```

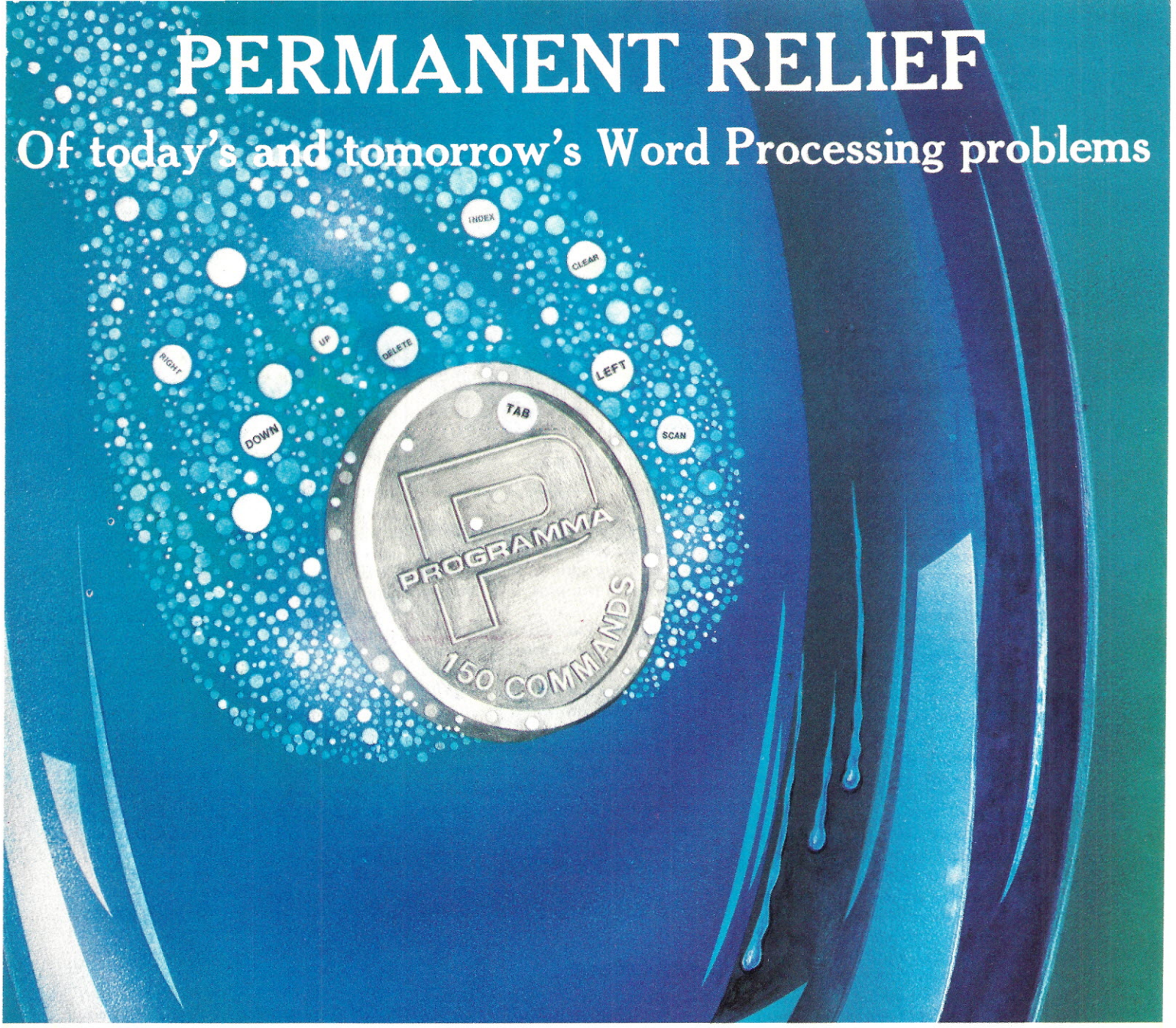
Listing 2. Monjana/1 sample disassembly of area dumped.

```
T:<PC> SR AC XR YR SP   MNC-CODE
E:033A 30 00 30 01 02   LDA $00
E:033C 30 4C 30 01 02   STA $1F
E:033E 30 4C 30 01 02   STA $21
E:0340 30 4C 30 01 02   LDA $29
E:0342 32 00 30 01 02   STA $20
E:0344 32 00 30 01 02   STA $22
E:0346 32 00 30 01 02   LDY =$01
E:0348 30 00 30 01 02   LDA ($1F),Y
E:034A 32 00 30 01 02   BNE $0355
E:034C 32 00 30 01 02   JSR $0395
E:0395 32 00 30 01 00   JSR $0388
E:0388 32 00 30 01 FE   LDY =$00
E:038A 32 00 30 00 FE   LDA ($1F),Y
E:038C 30 07 30 00 FE   INC $1F
E:038E 30 07 30 00 FE   BNE $0392
E:0392 30 07 30 00 FE   CMP =$00
E:0394 31 07 30 00 FE   RTS
E:0398 31 07 30 00 00   STA ($21),Y
```

Listing 3. Monjana/1 sample trace of program execution.

PERMANENT RELIEF

Of today's and tomorrow's Word Processing problems



Apple PIE + Formatter

Apple PIE (Programma International Editor) and FORMAT (text formatter) offer full strength solutions to today's word processing problems. These versatile, powerful programs provide document preparation and word processing capabilities previously found only on much larger computer systems.

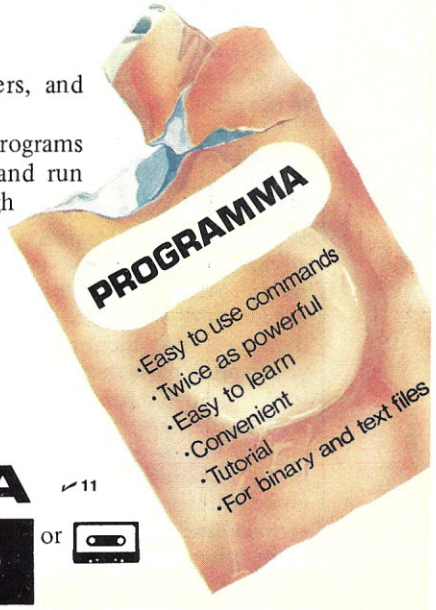
PIE is a general purpose, full screen editor that uses control keys and function buttons to provide a full range of editing capabilities such as search and replace, delete, copy, insert, move. Changes may be made directly anywhere on the screen and are shown as they are performed.

FORMAT uses simple instructions embedded in the input text to describe the desired appearance of the final document. It handles centering, underlining, indenting, page numbering, margins, headers, footers, even form letters, and includes a proofing capability.

These high-quality, cost-effective programs come with comprehensive documentation and run on a 32K Apple II. They are available through your local computer store or direct from Programma International, Inc. at the introductory price of $79.95*.

VIDEX VERSION T.M.
DOUBLE VISION T.M.
SUPR TERM VERSION T.M.
STANDARD VERSION

*December 1, $129.95.



PROGRAMMA ⌐11

3400 Wilshire Boulevard
Los Angeles, California 90010

or

Simple enough for the beginner. Versatile enough for the professional.

```
A:033A-03A2 TO 0800-0868
R:033A-03A2 TO 0800-0868
N:
N:RELOCATE PROGRAM
N:
M:0800-0868   0  1  2  3  4  5  6  7
W:0800-0807  A5 00 85 1F 85 21 A5 29
W:0808-080F  85 20 85 22 A0 01 B1 1F
W:0810-0817  D0 09 20 95 03 20 95 03
W:0818-081F  4C 39 C4 A2 04 20 95 03
W:0820-0827  CA D0 FA 20 88 03 F0 1A
W:0828-082F  C9 20 F0 F7 C9 8F D0 05
W:0830-0837  20 85 03 D0 FB C9 22 D0
W:0838-083F  09 20 85 03 F0 04 C9 22
W:0840-0847  D0 F7 20 98 03 C9 00 D0
W:0848-084F  DA F0 C1 20 98 03 A0 00
W:0850-0857  B1 1F E6 1F D0 02 E6 20
W:0858-085F  C9 00 60 20 88 03 91 21
W:0860-0867  E6 21 D0 02 E6 22 60 FF
W:0868-086F  11 FF A9 0E 20 AE F2 68
N:
N:NOW RELINK PROGRAM AT NEW LOCATION
```

Listing 4.

L and A = Link and Addressing. The L command adjusts all the relative addresses in a machine program as necessary after being relocated. The monitor searches the link area for valid instructions and tests if these instructions contain addresses which relate to the transferred memory area. If so, the monitor adjusts the address to correspond to the relocation. Before executing the L command, the monitor shows the addresses used with the last R or A command. By use of the A command, these addresses may be changed on request. See Listing 5.

One convenient feature of the L and A commands is the ability to create a "where used" list for selected addresses or subroutines. Whenever the starting address is 0000, no data is actually changed by the L command, but the information lines are still displayed.

S = Save. Saves an area of memory to tape with a filename of up to 14 characters. You cannot, however, save memory to disk as you can with Commodore's monitor. Also, there is no load command with Monjana; you must load via BASIC.

P = Print. Enables or disables echoing a copy of all monitor output to a printer or any IEEE device between addresses 4 and 7. This is a convenient feature, especially with the disassembly capabilities.

N = Note. Allows adding comment lines to the printer output wherever desired.

X = Change to BASIC. Exits the monitor and returns control to the BASIC operating system.

In addition to the relocating and disassembly features, Monjana also "pages" all screen displays for greater convenience. Whenever a full screen of information is displayed, a continue line is displayed. The monitor then waits for you to press the return key before continuing the current function.

All in all, the monitor is convenient and easy to use. It appears to be very well written, includes a number of user-oriented features and is of great value to any serious machine-language programmer. Many other extended monitors exist, but this is the only one I know of available in ROM. I'm not sure, however, if it will function properly with BASIC 4.0; I suspect that it will not work with the new ROMs.

```
L:0800-0868
A:033A-03A2 TO 0800-0868
I:0812       20 5B 08   JSR $085B
I:0815       20 5B 08   JSR $085B
I:081D       20 5B 08   JSR $085B
I:0823       20 4E 08   JSR $084E
I:0830       20 4B 08   JSR $084B
I:0839       20 4B 08   JSR $084B
I:0842       20 5E 08   JSR $085E
I:084B       20 5E 08   JSR $085E
I:085B       20 4E 08   JSR $084E
N:
M:0800-0868   0  1  2  3  4  5  6  7
W:0800-0807  A5 00 85 1F 85 21 A5 29
W:0808-080F  85 20 85 22 A0 01 B1 1F
W:0810-0817  D0 09 20 5B 08 20 5B 08
W:0818-081F  4C 39 C4 A2 04 20 5B 08
W:0820-0827  CA D0 FA 20 4E 08 F0 1A
W:0828-082F  C9 20 F0 F7 C9 8F D0 05
W:0830-0837  20 4B 08 D0 FB C9 22 D0
W:0838-083F  09 20 4B 08 F0 04 C9 22
W:0840-0847  D0 F7 20 5E 08 C9 00 D0
W:0848-084F  DA F0 C1 20 5E 08 A0 00
W:0850-0857  B1 1F E6 1F D0 02 E6 20
W:0858-085F  C9 00 60 20 4E 08 91 21
W:0860-0867  E6 21 D0 02 E6 22 60 FF
W:0868-086F  11 FF A9 0E 20 AE F2 68
```

Listing 5.

Monjana/1 for the 2001 series PET/CBMs is $98, complete with documentation. You can order the manual alone for $3.95. For more information, contact Elcomp Publishing, 3873L Schaefer Ave., Chino, CA 91710.

Elcomp Publishing also offers a book titled "Care and Feeding of the Commodore PET" for $11. Eight chapters cover various aspects of the PET hardware, complete with schematics and IC specification sheets. Although written primarily for the original 8K PET, it may be of limited interest to new PET owners.

BASIC 4.0/DOS 2.1

Many people have recently written with questions about the new BASIC 4.0 and DOS 2.1 ROM upgrades. It appears that they are confused about the changes and what's actually involved in upgrading. Let's examine the upgrades and their related changes.

Anyone with a 2040 disk can upgrade to DOS 2.1 ROMs without upgrading to BASIC 4.0. The original DOS Wedge program will still work with the new disk ROMs. If you upgrade your PET/CBM to BASIC 4.0, then you *must* upgrade your 2040 disk to DOS 2.1 for the system to operate correctly.

When you've upgraded to either BASIC 4.0 or DOS 2.1, you should not have to make any major changes to BASIC programs that use sequential disk files. You do not have to use the new disk commands provided by BASIC 4.0; all the original disk commands should still operate correctly. If any programs use random access files, then you may have a job on your hands. The handling of random access files has been changed quite a bit.

Otherwise, the only problem area I've seen is that the Block Allocate (BA) command does not return the track and sector of the next available block when attempting to allocate a block that is not available. Also, several features of the DUM 3.4 program supplied with the 2040 disk no longer work with the new disk ROMs.

Be aware that any disk formatted by DOS 1.0 cannot be duplicated, verified or written to once the DOS 2.1 ROMs are installed. This means you cannot create backup copies of any DOS 1.0 formatted diskettes once you change ROMs. Because of this, I strongly suggest copying all your diskettes onto newly formatted diskettes (formatted using DOS 2.1) and keeping the DOS 1.0 disks until you are absolutely sure the new disks are OK. You may even want to keep the original DOS 1.0 disks as master backups and file them away.

A new disk command has been included in DOS 2.1 to aid in copying your disks. All you have to do is format the new disk and then issue a copy command without any filenames: COPY D0 TO D1 using BASIC 4.0 or C:D1 = D0 with BASIC 3.0. This will copy every file from the old disk to the new disk. Be patient, this process takes much more time than a disk duplicate command, but it sure beats typing in a copy command for every file.

You can even take this opportunity to reexamine your assignment of disk IDs. It is now very important to use a unique ID for every disk. DOS 2.1 uses the disk ID to determine when a disk has been changed in a drive, so it knows when to initialize a drive. You no longer have to initialize a drive when you insert a disk; it's done automatically for you by DOS.

However, if two diskettes have the same ID, DOS will not know when to reinitialize the drive. Thus, it will continue to use the original block availability map (BAM) for the second disk. This will totally destroy the second disk when the wrong BAM is written to it.

Normally, this will not present a problem if you take care when assigning new disk IDs. However, when a backup copy of any disk is created, you now have two (or more) disks with the same ID. Be careful in what order you insert diskettes or issue the old initialize command.

If necessary, the auto-initialization function can be switched off by issuing the following commands:

```
OPEN 1,8,15
PRINT#1,''M-W'';
CHR$(243);CHR$(16);CHR$(1);CHR$(1)
```

Since you are recopying all your disks anyway, you may want to reorganize a little and put different files together on the same disk.

You may have another problem in this area if your old format disks are almost full. Newly formatted disks created with

DOS 2.1 will have six less free blocks than disks formatted by DOS 1.0. Thus, all your files from the old disk might not fit on the same new disk. Also, the total number of files has been reduced to 144 files maximum on any given disk.

I haven't had time yet to track down any low memory changes in the new BASIC, but I haven't heard of any changes in that area. However, the ROM subroutine addresses have been changed. Some of the changes are for the better, since a number of new subroutine pointers have been added at the top of memory. Just keep in mind that the ROMs have changed, and any PEEK, POKE or machine-language routines/programs are likely not to work. The new disk commands in BASIC 4.0 makes use of certain areas in the second cassette buffer for work areas. So be careful when you use utility programs written for the second cassette buffer; they may be destroyed by disk operations.

Another area of change is the addition of two new reserved variables—DS and DS$ for disk status. You can no longer assign values to these variables since they are now reserved variables assigned values by the system. Any program that used these variable names for its own purpose must be changed to use new variable names.

The variables DS and DS$ now contain the values normally read via the disk error and control channel, channel 15. They are automatically updated whenever referenced, after a disk operation is performed. Thus, you no longer have to read the error channel to see if an operation failed. Simply check the error number in DS or the message in DS$.

While on the subject of new ROMs, let's take a quick look at the new BASIC commands. In general, parameters for the new commands are not order dependent; the device, filename and unit will work in every permutation. Filenames may be in quotes or represented as a string variable.

Drive numbers are indicated by the letter D, followed by 0 or 1. The default drive number is generally 0. If you can specify more than one filename in a command, the default drive number for the second drive will be the last user-specified drive number. The unit number is optional on nearly all commands and defaults to 8. It is specified by the letter U, followed by an integer between 4 and 31 to identify the IEEE device number. Variables may appear as parameters, but they must be enclosed by parentheses, for example, U(A+2).

DOPEN #lfn,"filename" [,Ly] [,Dx] [ON Uz] [,W]—opens a disk file with the specified logical file number (lfn). Optionally, the file can be a random access file if a record length (y) is indicated. The file is normally opened for read operations unless the W option is specified.

DCLOSE [#lfn] [ON Ux]—closes a specified logical file or all disk files if a logical file number (lfn) is not given.

RECORD #lfn,r [,b]—is executed directly before any GET#, INPUT# or PRINT# to position the disk at the desired record (r) of a random access file. If this command is not executed, then the position accessed will be the next record directly after the last referenced record. Optionally, the exact character position (b) within the record can also be specified. This new command is transmitted to the disk control channel (channel 15) as a five-byte message. This message consists of the letter P, followed by the logical file number, the record number as a two-byte value and the character position.

HEADER "name",Dx [,Izz] [ON Uy]—performs the former NEW command to format a diskette with the name and ID (zz) specified. The advantage of using the new BASIC command is that the command requests a confirmation that you really want to format the disk. You must respond with "YES <RETURN>" for the command to execute.

COLLECT [DX] [ON Uy]—issues the former VALIDATE command to free up allocated space of improperly closed files on the disk. It also deletes their references from the directory and verifies the BAM stored on the disk.

BACKUP Dx TO Dy [ON Uz]—duplicates disk x onto disk y complete with disk name, ID, file layout and contents. This is the former DUPLICATE command, unchanged but much faster than before.

COPY [Dx] "Name-1" TO [Dy,] "Name -2" [ON Uz]
COPY Dx to Dy [ON Uz]—copies disk files just as before. One new option is the ability to copy all files from one disk to another with one command.

CONCAT [Dx,] "Name-1" TO [Dy,] "Name-2" [ON Uz]—concatenates one file (Name-1) to the end of a second file (Name 2). It issues the former COPY command with the appropriate arguments.

DSAVE "Name" [,Dx] [ON Uy]—saves a BASIC program on disk just as before with the SAVE command.

DLOAD "Name" [,Dx] [ON Uy]—loads a BASIC program from disk just as before with the LOAD command.

DIRECTORY [Dx] [ON Uy]—displays the disk directory from the specified drive (x).

RENAME [Dx,] "Name-1" TO "Name-2" [ON Uy]—changes the name of a disk file just as with the old command.

SCRATCH [Dx,] "name" [ON Uy]—deletes a disk file just as with the old command. However, with BASIC 4.0 a confirmation must be made before the file is actually scratched. This confirmation is only needed if the SCRATCH command is used in the direct mode.

APPEND #lfn, "name" [,Dx] [ON Uy]—allows you to open a previously written sequential file with the write pointers positioned to the next character position beyond the end of file. This allows adding data at the end of an existing data file without rewriting the entire file.

One last change in BASIC is the redefinition of the SHIFT-RUN sequence. This combination of keys now loads the first file from the disk in drive 0 instead of loading from tape 1.

I hope this list of commands has been helpful. The ROM upgrades seem to be well worth the effort: the new disk format is much more reliable than before; disk duplicating (for backups, etc.) is now much faster; the "garbage collection" is hardly even noticeable; and the new disk commands are more convenient than using the Wedge. Current 2040 disks are being shipped with DOS 2.1 installed, and a new 4000 series of 40-column PETs are being shipped with BASIC 4.0 installed.

Odds and Ends

Benson Greene (210 Fifth Avenue, New York, NY 10010) has an extensive accounting program available for only $35 on tape. This program was written for an 8K PET with new ROMs, 32K on Expandapet memory, 2040 disk and an Axiom printer. Conversion for other equipment should not be difficult, according to Greene. The program, called MASTER1, produces accounts payable/receivable, purchase order, acknowledgement, invoice, packing slip, voucher, statement, checkbook, cashbook, price lists and account status.

In addition, the program will design and produce any other type document required. Other features are proposed for a newer version designed for the 8032 CBM. The author warns the program is slow, but it still may be of interest.

The Central Illinois PET Users (c/o Jim Strasma, 3838 Benton Drive, Decatur, IL 62526) are offering free copies of their new *Midnite Software Gazette*. Simply send a self-addressed envelope with two stamps for return postage. Thereafter, simply send a replacement envelope with postage whenever you receive another issue. Their newsletter will contain brief reviews of various new programs and hardware for the PET/CBM.

I stand corrected on a comment in my October column! A reader in Texas wrote that the PET was actually seen on the "Super Train" TV show before appearing on "Pink Lady." Have you seen the PET anywhere else?

Correspondence concerning this column should be addressed to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

By Walter Koetke

Educators Are Buying

Software publishers Eye schools As a marketplace

But What about the Software?

The potential of the educational establishment as a marketplace for microcomputer software has attracted the attention of many corporations and a host of individual software developers. Most of those attracted are very interested in predicting the future of this market. While their predictions vary, there is general consensus that the size of the marketplace is already significant, with an expected growth rate that is quite impressive.

One generally conservative source places 1980 school expenditures for computer hardware and software in excess of 90 million dollars. Roughly 30 percent, or 27 million dollars, represents the software portion of this expense. The same source projects that educators will spend nearly 800 million dollars for computer hardware and software in 1985. Approximately 60 percent of that amount, or 480 million dollars, will be spent on software.

These figures illustrate that the annual educational expense for computer hardware and software in 1985 will be more than eight times this year's expenses. And of perhaps even more significance, the annual expense for software in 1985 will be almost 18 times that of this year. But what about the software? On what software should the money be spent?

Selecting the type of computer hardware most appropriate for educators today is not an easy decision. This topic was discussed in last month's column. It is interesting to speculate what hardware configurations will be available in 1985. The industry is changing rapidly. The two microcomputers most prevalent in schools today are the Model I TRS-80 and the small keyboard PET. Both of these machines are already out of production.

There does, however, seem to be one rather safe prediction—there will be lots of microcomputers in a variety of configurations. Seymour Papert's current work that provides individual microcomputers for each member of a third grade class will no longer appear to be a unique, idealized experiment. I suggest that students at most grade levels will have easy access to computing facilities. The existence of computer laboratories that can provide one computer for each member of a class is no longer unusual at the secondary school level and rather common at the college level. Spokesmen for Pittsburgh's Carnegie-Mellon University have vowed that by 1985 every freshmen enrolled in the university will be issued a microcomputer as part of the university's orientation package. Certainly many other institutions will follow the lead of Carnegie-Mellon.

Dr. Papert has observed that purchasing microcomputers to be issued to each first grader would add very little to the present expense of educating a child for 12 years. When you consider the educational potential of this expense, you might easily assert that the initial first grade cost increase would result in actual savings over 12 years. Microcomputers will be in the hands of perhaps the majority of college students, will be readily available to most secondary students and will be accessible by many elementary students. But what about the software?

The National Council of Teachers of Mathematics' highly regarded "Recommendations for School Mathematics of the 1980s" offers eight major agenda for action. The third recommendation is that "mathematics programs must take full advantage of calculators and computers at all grade levels." The NCTM goes on to explain that computers should be used in imaginative ways for exploring, discovering and developing mathematical concepts and not merely for checking computational values or for drill and practice. Similar recommendations can be expected in subject areas as well. But what about the software?

Let's take a look at the educational applications of today's microcomputers. These are all available right now. While much of their potential has yet to be utilized, all can be used in the classroom tomorrow or next week.

1. Computer literacy—one of the most urgent applications. Quite simply, computer literacy means learning what computers can and cannot do, learning how to write simple programs and learning that blaming the computer is rarely a valid excuse. Dr. Molnar of the National Science Foundation made a statement that might be paraphrased as "Any teacher who still thinks he or she might be replaced by a computer, should be." Dr. Molnar quite correctly feels that computer literacy must be expected of all teachers of any subject at any level. But computer literacy carries some changes in the educational arena. A computer literate secondary student will not accept the standard answer each September that his high school schedule was messed up by the computer.

2. Teaching programming—in my opinion, appropriate for all grades beginning with third. Seymour Papert recently demonstrated that nonreading preschoolers can learn to program, but his results are well ahead of the average classroom. Unless you're teaching programming as a part of a computer science course, I suggest you use BASIC, not because BASIC is the best of all languages (it certainly is not), but because the wealth of supporting material is readily and inexpensively available. This is not the case for any of the other languages often proposed as alternatives.

3. Computer science—the study of the computer and related ideas for their own sake. Students learn about the computer

Walter Koetke, Putnam/North Westchester BOCES, Yorktown Heights, NY 10598.

itself rather than using the computer in a variety of other areas. While the future may evolve a different set of priorities, I suggest that today's computer science is most appropriate and effective at the high school or college level.

4. Providing a tool for the gifted—an absolute necessity for any school system that is properly serving this special population. These are the students on whom our society will depend in the future, and we will all benefit if they are provided early access to the intellect-expanding capabilities of the computer. Stories of bright students and their computer feats are already legendary. The largest primes and the largest perfect numbers have all been discovered by bright students with access to computers. Repeatedly, these students demonstrate their inability to recognize a truly difficult or seemingly impossible problem by solving the problem. For the sake of all of us, let's see that they have full access to whatever tools they require.

5. Supporting special-education students—an application that produces positive results in the vast majority of cases. Its publicized potential often refers to technical types building special devices, but personal observations of teachers and special-education students using standard microcomputers and peripherals with teacher-generated programs suggest an even more impressive potential. There are many theories as to why so many special-education students respond positively to computer use, and those may be the subject of a future column. Providing a microcomputer for an interested teacher of special-education students is, however, a productive action regardless of the theories.

6. Drill and practice—often mundane, sometimes boring, and certainly an unaesthetic use of a powerful tool, but it works! The microcomputer can add several important dimensions to drill and practice. Most obvious are the immediate interaction and reinforcement provided to the student and the record-keeping aspects available to the teacher. Less evident but far more important is the ability to tailor drill and practice to meet the needs of individual students. Check last November's column for some examples of drill and practice personalization.

7. Problem solving—using the computer as a tool in one or more of the steps required to solve a problem. This was done effectively in mathematics and science classes for many years using time-shared terminals. With the additional capabilities available with today's microcomputers, problem solving should also become a viable application in several additional subject areas.

8. Simulations—using the computer to represent those things that are too hard, too time consuming, too expensive or too dangerous to do in reality. Simulations help answer "what if?" questions in a safe, timely and cost-effective manner. Effective uses of simulations were, for example, responsible for minimizing the danger as Skylab fell and as Three Mile Island overreacted. The design and use of simulations are becoming increasingly important in many fields, and understanding their proper applications, strengths and weaknesses is a skill we should impart to all students.

9. Games—have positive aspects from motivational carrot, to exemplary programming techniques, to developing problem-solving skills, to disguising learning environments in a variety of enjoyable forms. There are not many who still resist the value of appropriate use of games in a learning environment.

10. Text editing—not really something that can be done tomorrow in most schools. The hardware and software exist, but there remain two obstacles. Text editing assumes the availability of hard copy, but printers are not yet widely available in schools. Of even more importance is the fact that text-editing capabilities and techniques are foreign to most staff members, and their skills must be updated before they can pass those skills to their students. I believe that text editing will result in dramatic changes in the effectiveness of teaching English and writing skills. Students in third and fourth grade can effectively use text editors, and providing text-editing capabilities to students throughout their school experience should soon become an important goal.

The preceding list of applications is hardly controversial. Given the ability to add or delete just one application, I believe most would find the list complete and accurate. The list really does represent those applications that teachers, depending upon their own experience, are either already using or attempting to use. But what about the software?

Let's examine the world of microcomputer software as it pertains to education. There are certainly many developers of educational software. What are they doing?

At one end of the spectrum is Seymour Papert using the LOGO language with young children. LOGO is the only major language that was written specifically for children. Other more available languages such as BASIC are being used not because they are best for children or education, but because they were in the right place at the right time. Educators chose the best of what was already available rather than creating a new language that truly met the needs of the children. This utilization choice is not inherently bad. In fact, it was the best choice at the time. The only danger is that the educational community may become so absorbed in currently accessible languages that they become reluctant to adopt the major advantages of new languages becoming available.

The thrust of the work with LOGO is students writing their own programs—item 2 of our previous list. Their programming ability is then used as a major tool in teaching mathematics, logic, problem solving and even reading. Thus, the leading edge of educational software development lies in the area of language development appropriate for allowing very young students to write their own programs. A future column will be devoted to a detailed discussion of LOGO.

At the other end of the spectrum are the names of publishers long familiar in classrooms across the country. Their interest in educational software is quite evident—corporate profits. This statement is offered as fact, not criticism. This group is doing all software development on plug-in ROMs.

Their ad men are doing an excellent job. "By giving you ROMs we're protecting you. The software is unalterable and can't be messed up by the student." Sounds good until you think about it. The ability to modify software to meet the specific needs of individuals is an important characteristic of computers in education. you can modify the data, change the reading level, alter the rewards, personalize, and on and on, but not with unalterable software.

"We want you to be comfortable. If our program doesn't work, then the program is broken and you can return it for a replacement." Once again, it sounds good until you think about it. A program that cannot be improved does not exist. Programming is not a right or wrong skill. Solutions are evolved. Solutions can be improved. Giving the impression that the computer programs are either working or broken does not even contribute to computer literacy.

I suggest that just as the traditional approaches of traditional Wall Street firms are being challenged and often beaten by a new generation of individuals with reasonable knowledge and access to computers, so will the publishers be severely challenged. The resulting shake-up should be fun to watch. More importantly, I believe the students will be the winners. Hence the trailing edge of educational software development now lies in the offices of traditional educational publishers.

What should educators do tomorrow? I suggest that you are well advised to learn to program. Certainly all teachers will not develop large, original programs. However, I believe the majority of teachers can and should learn to program well enough to either modify existing software themselves or to direct others who modify existing software so it is tailored for specific classes or individuals. I also suggest that teachers acquire a software library of material appropriate for classroom use, but only if they're able to obtain both the program code and the ability to modify that code.

By Frank J. Derfler, Jr.

Coming In 1981

Talking terminals, software by phone on the horizon

The microcomputer world develops a different new product emphasis every year. In 1978 we found many different kinds of solid-state memory devices and boards, 1979 brought us a host of different terminals, and 1980 has to be remembered as the year of the hard disk.

Talking Terminals

What will we see evolve in 1981? My best guess is talking terminals. I know we have had voice synthesis and voice command recognition for quite a while, but the systems have been limited in capability and quality. This time, the consumer appliance field may be leading us into a new development that will (again) change the way we do things—even our data communications. Talking pinball machines, microwave ovens and television sets are about to enter on the scene. Can a talking terminal be far behind?

I am not predicting that computer terminals in the early part of the 80s will have the speech I/O capability of Captain Kirk's computer on the Starship Enterprise. Keyboards will still be a primary means of data entry, and we need to teach our kids keyboard skills. But speech synthesis and recognition will augment keyboards and be used for certain special-purpose terminals.

The average terminal could recognize certain voice commands, just as it now recognizes specialized keys and control codes. Terminals may have voice-recognition "extensions" that allow you to input data via microphone when you are away from the keyboard. This feature would be useful for inventory control, production lines, military command posts and other busy areas.

Lear Siegler, Inc., has recently announced plans for a speech-recognition system for its popular ADM-3A terminal. Terminals and peripherals may talk to you to get your attention. Printers may gently remind you of "low paper," and your terminal may tell you the computer is "ready" or "finished."

Speech I/O can come into its own in the areas of games and education. How about a game of Adventure where lions snarl, swords clash and monsters howl? How about a math drill program with spoken words of praise, applause and gentle correction? These things and many more are possible.

There are three competing methods of performing speech synthesis. The Votrax division of Federal Screw Works uses a principle called format synthesis, which relies on stored bits of words called phonemes and allophones. An early version of this kind of system is available for the TRS-80.

Texas Instruments uses computer analysis of how words are formed in the human vocal system to reproduce those words under a system called Linear Predictive Coding. Most of us have probably heard their Speak and Spell device.

National Semiconductor Corporation uses sophisticated waveform digitization, which is compressed to save memory space.

I won't go into any of the technical details, but if you are interested, the May 22, 1980, issue of *Electronics* carried more in-depth information about the systems. The main point is that these systems can store and reproduce 100 or more words or sounds using a fairly typical microcomputer system.

Speech recognition is a more difficult job, but it can be done well and economically with a vocabulary of about 100 words. Storage for 100-word reference patterns might use between 8 and 16K of RAM. You can do a lot of commanding and inputting with 100 words.

Watch for speech I/O devices. I am sure they will find uses we can't see right now, but they will certainly add to our communications capabilities.

Software by Phone

Have you noticed the trend toward shopping by telephone? I like it, especially when retailers supply an 800 toll-free number. I have done business with many of *Microcomputing*'s advertisers by phone, and the response and personal attention are rewarding. It had to come to pass that software could not only be ordered but also delivered over the phone.

If you have an Apple computer, you can buy software by phone and have instant delivery from the Telephone Software Connection (213-329-3715). You need an Apple with disk, Applesoft and the Hayes modem card. When you first dial into this system, you establish an account with credit-card billing reference. It takes one business day before your account is verified. After this initial verification, you select a password to let you buy software at any time.

Telephone Software Connection has some unique programs, most of which are aimed at data communications. Their prices range from $20 for some two-player games (one player can be remote) to $45 for a data transfer program that can transfer binary files from one Apple to another. Most programs can be completely purchased during a $2 weekend phone call.

The Telephone Software Connection has competition from free software exchanges, but their unique programs give them an edge. We are learning to beat the price of gas and the frustration of mail by squeezing more and more down our phone lines; this is part of the fun and value of dialing-up.

Spotlight

Amateur Radio Research and Development Corporation (AMRAD) is a nonprofit corporation in the Washington, D. C., area made up of folks interested in both microcomputers and amateur radio. This active and innovative group runs both an amateur radio two-meter repeater and a computer message system. They also publish the most interesting newsletter on computer and amateur communications I have found.

Address correspondence to: Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

Two Great New TRS-80 Computers. Radio Shack—Setting New Standards For Price and Performance!



13-Inch Color TV Receiver Available Separately. Only $399*

16K TRS-80 Model III. The new standard in personal computers—packed with the advanced features you want, yet priced unbelievably low! The Model III's handsome *one-piece* cabinet includes a high resolution 12-inch monitor that displays 16 lines of 64 upper/lower case characters, and graphics. It also includes a 65-key typewriter-style keyboard with data pad. There is room inside for two optional double-density disk drives—and you can add two more external drives for a total of approximately 670K bytes of on-line storage. Model III comes with a two-speed cassette interface, so most of our huge library of Model I, Level II software can be used. And the new 1500-baud mode gives you really fast cassette I/O. The very powerful Model III BASIC language, contained in 14K of ROM, features automatic line numbering, tracing, PEEK and POKE, machine language programming, keyboard-controlled screen print, I/O device routing, repeating keys, special characters and lots more. Other Model III features include a built-in real time clock, cassette jack and Model III bus, plus a built-in printer interface for direct connection with Radio Shack printers. With the built-in RS-232 firmware and the optional internal RS-232 board, communications is a snap! Model III is expandable to 48K RAM at any time, and is also available with 4K RAM and Level I BASIC (for only $699*). A full-blown 32K, 2 disk system with RS-232 is yours for only $2495.* This is the breakthrough you've been waiting for. Come in and try Model III today. **16K TRS-80 Model III** . . . . . **Only $999***

16K TRS-80™ Color Computer. Vivid 8-color graphics, sound, the high performance 6809E microprocessor and more—at a very affordable low price! This amazingly portable new micro attaches in seconds to any TV set. Use it at work, at school or at home. Its Extended Color BASIC language provides unique commands for graphics manipulations, easy machine language programming, complex musical sounds (with more than one note!), PEEK and POKE, specific error messages and much more. A built-in RS-232 serial interface lets you attach a modem for communications or a serial printer. Of course, you can save your programs on cassette (at a fast 1500 baud)—or just pop in one of our instant-loading ROM Program-Paks for a wide variety of fast-paced games and valuable personal applications. Like all TRS-80s, it's easy to expand—add a printer now, disk drives are on the way. An optional pair of joysticks brings extra maneuverability and real excitement to computer games. The TRS-80 Color Computer is also available with 4K RAM and Color BASIC (at just $399*). This is the multipurpose computer you've been waiting for. Try it today at your nearest Radio Shack store, Authorized Dealer or Computer Center. **16K TRS-80 Color Computer with Extended Color BASIC** . . . . . **Only $599***

Radio Shack®

The biggest name in little computers™

A DIVISION OF TANDY CORPORATION

*Retail prices may vary at individual stores and dealers. Ask for our FREE 1981 TRS-80 Computer Catalog or Write Dept. 84, 1300 One Tandy Center, Fort Worth, Texas 76102

It had to come to pass that software could not only be ordered but also delivered over the phone.

If your interests fall across these two areas, you should contact AMRAD at 1524 Springfield Ave., McLean, VA 22101. Their newsletter is $12 a year.

The AMRAD computer message system was probably the fourth one in the nation. The original system is now off the air. It has been replaced by a very high-quality CBBS run by Terry Fox (703-734-1387), but I would like to briefly describe the old system because of its unique design.

The AMRAD system serves as a model of what can be done with very little. The hardware consisted of an AMI computer board using a 6800 CPU, a keyboard and monitor, 16K of RAM and a much-converted answer-only modem. That's all—no whirring disk drives and great stacks of program options.

The purpose of the system was to beat what I have named the "Time Tyranny of Telecommunications." The little system left and received messages at convenient times. The message program was written in machine language and occupied a tiny space in RAM. A small HELP listing was available, but otherwise the system only asked for your command. The message numbers were even in hex to save program space. All messages resided with the program in RAM.

This method of providing a message service had both good and bad points. It was very sensitive to lightning and power failures and had no back-up; if it crashed, the slate was wiped clean. RAM space was limited, so everyone had to leave short notes and clean their messages off frequently.

This required a little club discipline, but it was easier to do than you might think because the brevity of the commands and instructions promoted brevity in the messages. It was inexpensive and simple. With this design philosophy, you could certainly get a system operational using a KIM or similar single board computer for a very minimum expense.

The message system was also tied into the amateur radio repeater system. Local hams could access the system using Murray (Baudot) code in the two-meter amateur band. (Murray code was used because transmission of ASCII was not legal then.) This access proved to be redundant to the phone line because of the local nature of the radio link, and it was eventually removed to save program space. This was an innovative idea and might see more use now that ASCII transmission is legal on the high-frequency bands.

AMRAD also runs a separate but identical system for the deaf in Virginia called the Virginia TTY. Users with Murray terminals can reach this service at 703-765-2161.

Another important AMRAD project is the Handicapped Educational Exchange (HEX). This is a bulletin board system set up by AMRAD and supported by a federal grant from the Bureau of Education for the Handicapped. It will accept inputs from either a 60 wpm Murray terminal or 110/300 baud ASCII terminal.

HEX runs on a Smoke Signal Broadcasting computer with a 6800 CPU. It uses two eight-inch double-sided floppy disks for storage. The program is similar to the CBBS format, but with explanations worded for the nontechnical users. It is written in BASIC and runs in 32K. The system can be reached at 301-593-7033.

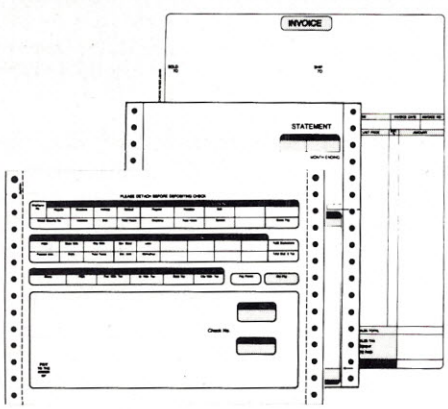
Because of its unique character, the messages left on this system should relate to the handicapped, education or communications and microcomputer technology.

AMRAD has also done a lot of work in interfacing the Murray TTY terminals used by the deaf with microcomputers. Two names stand out: Bob Bruninga and Paul Rinaldo. Bob is gone from the area, but his work and contribution cannot be forgotten. Paul can be reached through AMRAD.

Datacomm Fun

Many different forms of data communications are available to you as a private individual. They range from local message systems, to commercial systems such as The Source, to sending your messages out on high-frequency amateur radio bands. If you have any interesting notes or experiences in these areas, drop me a line. Send paper mail to PO Box 691, Herndon, VA 22070, and include a stamped envelope if you expect a reply. Send electronic mail to TCB967 on The Source, 70003, 455 on CompuServe or the AMRAD CBBS. ■

CONTINUOUS FORMS FOR YOUR COMPUTER



SELF PROGRAMMERS:
extensive stock line to choose from

SYSTEMS USERS:
forms designed to fit your format

SOFTWARE HOUSES:
complete forms support for your users

COMPUTER DEALERS:
forms installation assistance

SERVICE BUREAUS/CPA's:
quantity discounts

Please tell us your business application and the program you are using. We will promptly send you the forms that will best accomodate your needs.

✓ 58

Checks To-Go

8384 Hercules St.
La Mesa, CA 92041
(714) 460-4975

name _____ phone no. _____
organization _____
address _____
city, state _____ zip _____
hardware (processor type) _____
software (p/r, a/p) _____
software (a/r, inv) _____
☐ programmer ☐ dealer ☐ CPA/service bureau
☐ end-user ☐ software house ☐ other

By Eric Maloney

Computer Talk

A new column takes a look at computers and language.

In 1789, Benjamin Franklin penned a letter to Noah Webster praising the "Zeal for preserving the Purity of our Language" that Webster exhibited in his predictionary work, *Dissertations on the English Language.*

But Franklin, notwithstanding his predisposition for innovation, took Webster to task for approving several new words that he felt deserved severe reprobation. In particular, he called onto the carpet four abominable verbs: notice, advocate, oppose and progress.

Of course, if an editor today took exception to these words, his boss would probably suggest a long vacation. But change is one of the outstanding characteristics of language. What was unacceptable yesterday is used without a second thought today, and what is common today will be an archaism tomorrow.

This is particularly true of the American language. From the beginning, we have displayed an extraordinary drive to mangle, reshape and invent the tools with which we express ourselves.

This lust for linguistic mutilation grew largely from our compulsion to distinguish ourselves as a distinct cultural organism. Our ancestors deliberately flaunted their bastardizations of the good King's English in the face of the Mother Country as a demonstration of disrespect and independence. Two hundred years later, we're still at it, continually exhibiting our disdain for convention and authority.

But more importantly, America has found itself at the forefront of some of the most significant developments in recorded Western history. And as each new situation has arisen, we have struggled to find a new vocabulary to describe the uniqueness of our experiences. Culture, art, science, politics, psychology, religion —each change, each evolutionary and revolutionary step has inspired a new set of words, a new range of self-expression.

Which brings us to the subject at hand: computers.



This era of the computer offers word hounds the opportunity to study firsthand the impact a new technology can have on language. Through a process of theft, invention and creative redefinition, the computer world has developed an elaborate and highly specialized lexicon.

Computerists have a basketful of new and borrowed words at their disposal. Examples include "modem," "software," "bit" (short for "*bi*nary digi*t*"), "access" (as a verb), "peripheral" (as a noun), "data" (as a collective noun meaning "information"), "COBOL," "BASIC," "FORTRAN," "byte" and the verbs "peek" and "poke."

Fortunately for the language—and unfortunately for the editors who have to make some sense out of it—most computerists are blissfully ignorant of such details as consistency, spelling and proper usage. One fellow writes "BASIC," and another writes "Basic"; one prefers "disk" while another uses "disc"; one says "data is" and another says "data are."

It is time, however, to decide on a lingua franca. While foolish consistency may be the hobgoblin of little minds, wise consistency is the friend of those who wish to communicate concisely and effectively.

This is where editors enter the picture. It is our job to make the pronouncements that no one else has the temerity to make.

This doesn't mean that we make any actual decisions. Language is the property of the people, and history has proven that authorities and experts are curtly dismissed from the table. (Even Noah Webster couldn't popularize such inventions as "ile" for "aisle" and "ake" for "ache.")

But we can keep track of what's going on. And in the process, perhaps we can make a few more people aware of their language and how it should be used.

This column, then, will be a scorecard of the computerist's language—what it is, where it comes from, and where it is going. I'll cover such topics as the origin and history of words, the infusion of computer jargon into the common vernacular, capitalization and acronyms, word invention and word meaning.

In addition, I'll be citing examples from the pages of this and other magazines to illustrate points or raise questions.

Have any comments? Know any etymological trivia? (I'd love to know, for example, the origin of the word "snivitz.") Feel free to write. Perhaps in the coming months we can all learn to use our communications skills a little more effectively.

* * * * *

"Third," "second" and "first" are the ordinal correspondents to the cardinal numbers "three," "two" and "one." So what's the ordinal partner of "zero"? Several of our writers have suggested "zeroeth," as in the phrase "on the zeroeth track of the disk." This innovation, while pragmatic and practical, has not gone over big here at the magazine. I prefer "naughth," which would seem to have a cousin in the word "eighth," but nobody likes this one, either. Our final decision: the ordinal equivalent of "zero" will be "zero." And another golden opportunity to get into the *Oxford English Dictionary* goes by the boards.

Edited by Eric Maloney

Banking At Home

Service could presage big boost for Radio Shack

Micros and Banking

Express Information, a home banking service that debuted recently at the United American Bank in Knoxville, TN, could signal an important new microcomputing marketing strategy for the 80s.

By next year, Radio Shack could place as many as 100,000 new TRS-80 Color Computers in the homes of bank customers across the country who want to take advantage of the United American Service Corporation's new bank-by-computer product. In addition, customers will have access to the CompuServe Information Service, significantly increasing its total number of subscribers.

While no one is making any predictions, the service—developed and marketed to banks by the UASC—could spread rapidly. The UASC has already been contacted by some 400 banks, including, according to one report, five of the top 50 in the nation.

The UASC offers data processing and marketing services for more than 30 financial institutions in Tennessee, Virginia and Kentucky. It is owned by 12 southeastern banks, including the UAB.

Because the UAB service started only last fall, bold forecasts are risky. But the UASC, Radio Shack and CompuServe are confident that the hardware and software capabilities exist. The largest deterrent at the moment seems to be how successful the American banking industry perceives the Knoxville efforts. Traditionally, bankers do not display the microcomputer industry's bubbly entrepreneurial optimism.

How the Service Works

The way the service works, the bank issues a certificate to the new home banking customer. He takes it to a Radio Shack store, which provides him with the computer and a modem. Customers can either lease or buy the computer.

The UAB's first group of microcomputer bankers—they number about 400—are being offered limited service. But by the end of 1981, they will be able to use their micros to pay bills, to monitor checking account transactions and for bookkeeping.



A customer could, for example, instruct the bank to pay his electric bill, specifying the amount and the date. In the process, he could get a readout of all his previous transactions and his current balance.

Customers will also be able to use the service's file-sorting capabilities at tax time, calling up, for instance, a record of all medical expenses for the year.

The success of the Express Information service hinges largely on consumer acceptance of banking without the comfort of checks, bank books and hard cash. Tom Sudman, UASC president and UAB executive vice-president, says that the UASC has developed a number of ways to make the customer feel that his checking account is secure and reliable.

"All the resistance has come when we do not give the consumer reinforcement," he says. "But we are now seeing enthusiasm we did not have before because people have seen the reinforcement they're getting."

When the customer wants to pay a bill, for example, the computer asks a series of questions so the customer knows exactly how much money he is paying, where it is going and when. The system includes options to cancel, and transactions are reversible.

Also, at the end of the month, each customer receives a hard copy of his transactions, which can be checked against the computer's and customer's records.

Sudman also acknowledged customer concerns that their accounts might be

PUT THE SUPER BUSINESS SYSTEM TO WORK FOR YOU...

TRISA®

SUPER BUSINESS SYSTEM

THE ONLY COMPLETE ON-LINE BUSINESS SYSTEM AVAILABLE
®TRS-80 MODEL II – DYNABYTE®– MOST ANY CP/M® SYSTEM
– All systems except TRS-80 require a BLOCK MODE terminal –
NOTE: TRISA requires the use of FMG's CP/M on TRS-80 Model II.

SPECIAL LIMITED INTRODUCTORY OFFER . . .

$3,000

– INCLUDES –
General Ledger – Accounts Receivable
Accounts Payable – Inventory
Payroll

FEATURES

- Invent custom applications of your own design
- Complete Multi-Keyed Indexed Data-Base built-in
- Add new applications whenever you need them
- On-line custom report generator
- Custom letter writer merges with any on-line application
- On-line ENTRY, QUERY, DELETE, MODIFY
- On-line Index Processor creates list of keys
- Automatic file scanning
- Uses 32 bit Signed binary math
- All applications may be on-line at all times
- Immediate on-line text storage and retrival
- Custom applications at any time
- Data Base allocation dynamically maintained by system
- On-line entry of new applications
- Operating speed independent of storage capacity and number of records
- Capable of handling up to 1.2 Gigabytes of data storage without loss of speed
- Never more than 3 disk accesses to find a record

This includes all features listed above. Applications may be traded 1 for 1 with those listed except for . . . Criminal Justice Information System and Complete Chamber of Commerce Information System.

APPLICATIONS

- General Ledger
- Accounts Receivable
- Accounts Payable
- Inventory
- Order Entry
- Payroll
- Patient History
- Patient Billing
- Gun Registration
- Customer Information System
- Client Billing System
- Sales Information System
- Shipping Information System
- Criminal Justice Information System
- Mail List System
- Parts Tracking Information System
- Complete CHAMBER of COMMERCE Information System
- Complete Mail Order Business Information System

(Any application may be customized to your needs)

UNIQUE Systems, Inc.

SPECIAL PRICING AVAILABLE TO DEALERS AND DISTRIBUTORS!

DEMO DISK...$50 (demonstrates all features of TRISA®)
(plus $3.00 shipping and handling)

TRISA Manual – $50.00

KISS® & KBASIC®

(FOR THE TRS-80 MODEL II with CP/M)

"KISS" means . . . KEYED INDEXED SEQUENTIAL SEARCH

KISS has 31 different command functions that can handle your DATA BASE requirements with ease. The number of keys for each record is unlimited. No more than 3 disk accesses to find any record no matter how large your data file is or the number of keys.

KISS & KBASIC will also run on any standard CP/M System.

- KBASIC is ®MICROSOFT'S 4.51 Disk Extended BASIC with KISS installed as part of the Basic Interpreter for lightning fast record retrieval.
- The KBASIC structure has over 20 new easy to use commands that will cut your coding time in half. In addition to all the KISS commands, you also have available 32 bit signed binary math and ACSII to Binary conversion and Binary to ASCII conversion routines for a total of over 138 Basic Commands.
- When you buy KBASIC you get 2 manuals (282 pages) and a Microsoft relocatable module of KISS. You can link the KISS related modules into your own machine language programs or link it into a basic program compiled by BASCOM.

☐ **KISS & KBASIC**
Includes manuals. Supplied on IBM 3740 single density 8" diskette.
Requires CP/M.

KISS & KBASIC	**$585.00**
KISS	**$335.00**
KISS Manual only	**$ 25.00**
KBASIC Manual only	**$ 25.00**
BASCOM Interface to KISS	**$ 25.00**

AVAILABLE FOR IMMEDIATE DELIVERY
LICENSE REQUIRED

☐ **CP/M 2.21**
Complete CP/M with Realtime clock. Double and single density.
Single or multiple drive system.
CP/M $200.00

TERMS: COD (All items shipped First Class Mail)
Please add $3.00 for shipping and handling.

✓186

UNIQUE Systems, Inc. • Executive Offices – 279 Hickory Trace Dr. – Nashville, TN 37211

(615) 889-4390

TRISA is a TM of Unique.
CP/M is a Registered TM of Digital Research.
TRS-80 is a TM of Radio Shack, a division of Tandy Corp.
KISS & KBASIC is a TM of Eidos System Corp.
DYNABYTE is a TM of Dynabyte, Inc.

✓ Reader Service—see page 226

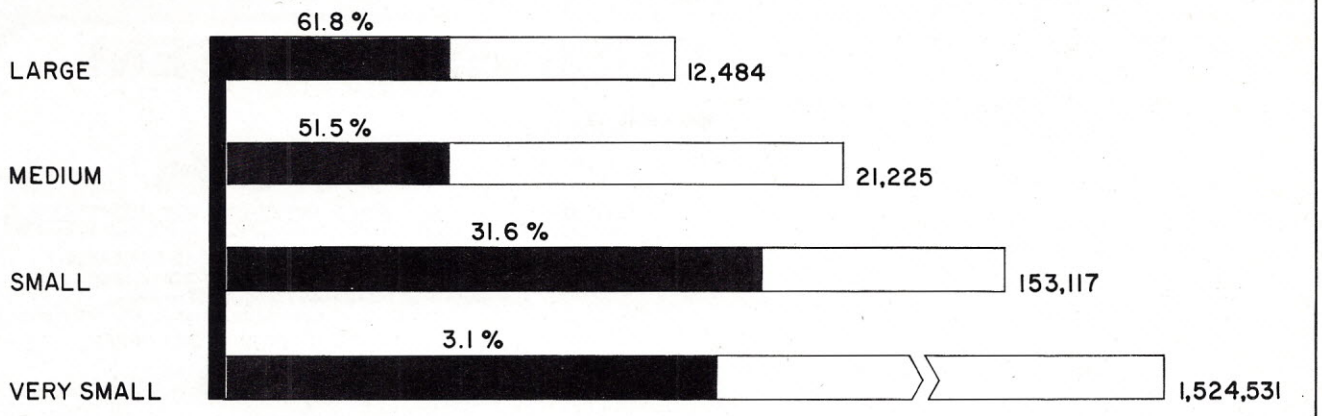


Table 1. Computer penetration by company size. While 62 percent of the larger companies, vs only 32 percent of the small and three percent of the very small companies, have systems, the actual number of installations is about equal. (In this chart, latter numbers represent study's projected, not total, universe.) (Source: Focus Research Systems, Inc.)

tampered with by sophisticated computer crooks. The bank hopes to provide adequate security with a special ROM security pack and a secret code number for each customer.

"I can't say that it's never going to happen," Sudman says. "But when everything is simply entered in ledgers in the back of the bank, someone on the cleaning crew could look at your records and we'd never know. At least here we know it's happened and can trace it down." He added that the UAB has successfully traced and prosecuted every case in which it has been involved.

Other Electronic Services

Express Information is only one of a series of electronic banking services being offered by the UAB.

"The banking industry first moved to full-service, then to drive-ins, and then to branch banking," says Sudman. "Today it's 24-hour automatic tellers. But we're moving into a new hierarchy of products."

As part of its electronic service, the UAB has built four Express Banking Centers in outlying districts of Knoxville. The buildings are completely electronic, and offer 85 percent of the bank's services.

The bank also offers an Express Statement service, which lets the customer get summary statements on a CRT terminal in the bank lobby. The customer can also push a button and get a hard copy printout.

And a service called Express Tel-a-Pay lets customers pay bills over the telephone.

Convenience, of course, is the major advantage of electronic banking. But the bank stands to benefit, too. It costs 40-50 cents to process a check; the same item can be moved electronically for about 3 cents. And fewer people are needed to handle paperwork.

A Look Ahead

All the parties involved acknowledge that home computer banking is not an end in itself.

"We want the consumer to develop a relationship with their Radio Shack store," says Sudman. "We're trying to convince the consumers that while they might not be interested in personal or home computing, they might be interested in better financial personal management."

CompuServe's Richard Baker echoes Sudman's remarks: "We're always interested in extending the scope of the CompuServe Information Service, and we see this as an opportunity to do that. We also recognize that banking is a very popular way of getting into home computers. Everybody can identify with banking; everybody banks in one form or another."

In other words, banking by microcomputer offers a legitimate practical application for the average consumer. Once he's got his TRS-80 installed, he can be led to discover CompuServe and other micro capabilities.

How fast could it spread, and to what degree? Sudman says 20,000 installations by from five to 20 banks by the end of this year. David Beckman, vice-president of advertising at Tandy, says that 20,000 is a low-end estimation: it could be as many as 100,000. In any case, the UASB is not restricted to the 30-odd banks it serves; nothing is holding it back from expanding nationwide, which is their expressed intent.

"It wouldn't take too much to offer this service nationwide," says Baker. "The software exists; it's a question of hardware."

"We've already manufactured a quarter of a million computers with little trouble," says Beckman. "We can supply them as they need them."

Does the Knoxville project presage an era of completely electronic banking? Sudman says no.

"One of the mistakes bankers make is saying it's an either-or proposition. But consumers enjoy having a choice. This is not going to mean the end of checks. People will still write checks; they will still put money under their mattresses."

This is the first of two parts on electronic banking. Part two will appear in next month's Micro-Scope column.

Small Businesses Buying Systems

Only 6.7 percent of American small businesses have on-site business computers, says a recent market study, but that figure could increase by up to 25 percent within 12 months.

The study, "Small Computers for Small Business," was done by Focus Research Systems, Inc., for Time Magazine. It is based on a larger study, "Small Businesses: Computing and Data Processing," published earlier last year.

The study defined "small business" as any company with less than 500 employees or with less than $25 million in sales. According to Census Bureau statistics, some 3.5 million companies qualify as small businesses. Based on its original sample of some 20,000 businesses, Focus Research estimates that some 195,000 companies have computers. The vast majority—nearly 82 percent—use manual methods to process data.

When broken down by company size, Focus's statistics show that computer penetration is most with larger companies and least with the smaller companies. (See Table 1.) Conversely, medium and small companies are more likely to buy systems.

Following are some other statistics compiled by FRS:

- Of the types of businesses surveyed by Focus, manufacturing has the highest computer penetration, with 9.8 percent, followed by wholesale businesses (8.6 percent) and transportation, communication and utilities (8.6 percent). At the bottom of the list are finance (3.4 percent) and agriculture (4.5 percent). (See Table 2.)

● Accounts receivable, accounts payable and payroll lead the list of most frequently mentioned applications, while sales analysis, cost accounting and order entry are at the bottom. But among possible users, inventory control is first. (See Table 3.)

"Regardless of size or industry, they want computers principally for traditional 'bread and butter' applications," says the Time Magazine report, while the original study adds, "None of the highly touted new applications—word processing, for example—had any standing."

● In the original study, 60 percent of those companies questioned had no staff programmer.

● International Business Machines leads the pack of vendors who have installed computer systems in small businesses, with a 33.8 percent share. It is followed by Burroughs (10.2 percent), NCR (7 percent) and DEC (5.9 percent).

Focus defined a small business computer as any computer "found to be used in small businesses."

For more information on the Time Magazine study, write Mr. John H. Stradal, Time Marketing Department, Time and Life Building, Rockefeller Center, New York, NY 10020. The detailed study is available for $495 from Focus Research Systems, Inc., 342 North Main St., West Hartford, CT 06117 (203-561-1047).

FCC Turns to Darwin

The Federal Communications Commission, says Chairman Charles Ferris, has entered a new era of regulatory Darwinism: it now insures the survival of the fittest instead of the survival of the fattest.

Ferris, speaking before the National Press Club in Washington last October, said that the FCC "is allowing new technologies and new entrepreneurs to achieve the potential that burdensome regulation denied them in a previous era."

The FCC, Ferris pointed out, has, within the last three years, opened up the common carrier market, deregulated satellite earth stations, ended Western Union's telegram monopoly and AT&T's long-distance telephone monopoly, created new clear channel assignments for radio, increased the number of VHF television stations around the country and deregulated cable and subscription television.

These policies, he said, "are the essence and the genius of the free enterprise system: that the public and not the government can have the power to choose the product they want at a price they are willing to pay. Through their choices, some entrepreneurs will win and some will lose, but they all must try harder."

Ferris compared the telecommunications and information industries of today with the steel and automobile industries of ten years ago, and warned that the former must anticipate the problems that led to the current crises facing the latter.

"I am determined that we not allow an environment that impedes innovations in our information services and allows others to surpass this country's leadership in the fields of telecommunications and information handling," he said.

Ferris pointed in particular to the First Amendment rights of free speech guaranteed to the print media, but which many people claim are denied the broadcast media. Television sets will soon become receivers of information traditionally found in newspapers, and "how we treat the legal obligations of that information tomorrow may well depend upon the broadcasting framework we create today."

Will new technologies thrive at the expense of older ones? No, Ferris said. The FCC is simply developing market structures that "exact a price from those who are complacent." It is up to the television networks, the telephone companies and the print media to meet the challenges of the future.

"I issue these challenges—to the established industries looking for a way to stay on top, and to the new entrepreneurs seeking a foothold—in a spirit of faith and optimism," Ferris concluded. "I know that the networks, the telephone companies and our nation's newspapers and magazines hold vast and as yet still untapped potential for serving the public."

Type of Business	Pct.
Agriculture	4.5
Mining and Const.	5.6
Mfg.—Process	10.6
Mfg.—Discrete	9.4
Trans., Comm., Util.	8.6
Wholesale—Durable	8.6
Wholesale—Nondurable	8.6
Retail	6.6
Finance	3.4
Services	5.5

Table 2. Computer penetration by type of company. (Source: Focus Research Systems, Inc.)

Current Users	Pct.
Accounts Receivable	51
Accounts Payable	45
Payroll	40
General Ledger	26
Inventory Control	26
Billing	23
Purchasing	15
Order Entry	8
Cost Accounting	7
Sales Analysis	6

Possible Purchasers	Pct.
Inventory Control	42
Accounts Receivable	34
Accounts Payable	28
Payroll	23
Billing	15
General Ledger	14
Purchasing	10
Cost Accounting	8

Table 3. Most frequently mentioned computer applications. Current users listed their three most important applications, while possible users mentioned their two most important applications. (Source: Focus Research Systems, Inc.)

Computer Tutors for Delinquents

An organization in Brooklyn, NY, is using computer games as part of its tutoring program for former offenders and youths with learning problems.

An article in the November 2 issue of *The New York Times* describes how the Fortune Society uses such games as tick-tack-toe, hangman and concentration to stimulate the interest of youths who might otherwise be on the streets raising hell. The Society uses a Commodore PET.

The idea behind the program is that while some kids are not interested in math per se, they might be interested in computer games for which they must learn math.

Divorced? Tired? Alone? Join the Club

Are you a divorced, tired loner who prefers machines over people? Then you've got the characteristics of the average data processing professional, says a recent issue of *Datamation* magazine.

The report says that the unconventional hours, the deadlines and the stress cause professionals to have trouble communicating with people and resolving conflicts. As a result, the person's friends, family and fellow employees also become more stressed.

The report says these problems will be partly alleviated as the computer industry—particularly software manufacturing—stabilizes.

MICRO QUIZ

What Does This Program Do?

What integer will be printed when the following program is executed?

```
S=0
N=48
FOR D=2 TO INT (N/2)
    IF N/D=INT (N/D) THEN S=S+1
NEXT D
PRINT S
```

(answer on page 204)

LETTERS TO THE EDITOR

OSI in the sky, Supporting the 6800, In defense of Heath, TRS-80 to the rescue

Out of the Blue

"OSI in the Sky" (October 1980, p. 102) is *exactly* the kind of how-we-did-it, what-it-cost article I'd like to see more of in the future.

Enthusiastic computer salesmen convince too many small-business owners that an expenditure of less than $2000 can solve all their problems overnight. Having articles like this from Sky Publishing enables us unbiased bystanders to counter some of the salesmen's claims. While subscription fulfillment is not the average business problem, the article points out the costs and time required to properly implement the solution to a problem of a certain size.

Surely more readers could provide details of some of their successes and failures in attacking the problems of the small-business operator. Let's see more articles like this, please!

Ken Barbier
Borrego Springs, CA

The Cost of a Utility

The article by Frank Derfler ("What Is the Utility of a Utility?" October, p. 72) suggests that "You can buy a lot of five-dollar hours for all of the money you might spend on disk drives, memory and languages" by connecting to a computer network like The Source or MicroNET. Whether this is true or not depends on the number of connect hours you use and if you make use of "non-prime" time. Small businesses often must use computer services during prime time (6 AM–6 PM, Monday–Friday) and only rarely require highly sophisticated software unavailable for microcomputers. If only four hours of connect time are used each workday, The Source charges about $1200 monthly. In less than one year it would cost less to purchase any of several business-oriented microcomputers and the best software now available.

The Source or MicroNET does offer rapid access to interesting information, but small businesses are well advised to carefully investigate the expense of using such computer networks for all their computer needs.

Richard Ainsley
Visalia, CA

Support for the 6800

John Travares' letter in the October issue ("SWTP Is No Fun," p. 27) makes some excellent points. I, too, own an SWTP 6800 and am very pleased with it. My complaint is that every time I turn around, someone is attempting to sell me 6809 hardware and/or software. Now, I am familiar with the 6809 and am well aware of its advantages over the 6800. However, not all of us can afford to upgrade our systems to 6809s.

I guess my real hang-up is that when I write to a company and specify that I want information on products for the 6800, I expect at least half of the information to be on the 6800. Instead, at least 90 percent, and usually 100 percent, of the information I receive is for the 6809. Isn't anyone going to support the 6800 anymore?

Ken Fulton
Morgantown, WV

Super Snooper

Ken Barbier's article on the 8085's undocumented op codes ("The Secret Life of the 8085," September, p. 114) shows a good deal of careful detective work. He raises a number of points in his article. The RHR (rotate HL right through carry) instruction leaves the high bit unchanged, but far from being "more trouble to learn than it is worth," this instruction can be very useful. Anyone who has done a moderate amount of 16-bit programming will recognize this instruction as an arithmetic shift right, aka divide by two on a signed 16-bit integer.

The caveats at the end of the article *cannot* be overstressed. These mnemonics will work only with 8085s from Intel (or from another vendor using Intel masks) and only until Intel decides to make design changes to the chip. As Ken said: "Be forewarned." But forewarned is forearmed, and 16-bit instructions are handy (even if you didn't pay for 'em!).

H. W. Neff
San Leandro, CA

Leave Your Options Open

Re "Computerized Estate Planning" (*Kilobaud Microcomputing*, October 1980, p. 31).

The subtitle, "sorting the various options for the final settlement," is rather ambitious, since the program data consists entirely of factual data, except perhaps the "estimated or assumed year of the wife's death."

The program makes some unstated assumptions, such as that the income from savings prior to the man's death is spent, not compounded. This is unlikely when data item 890 is not zero.

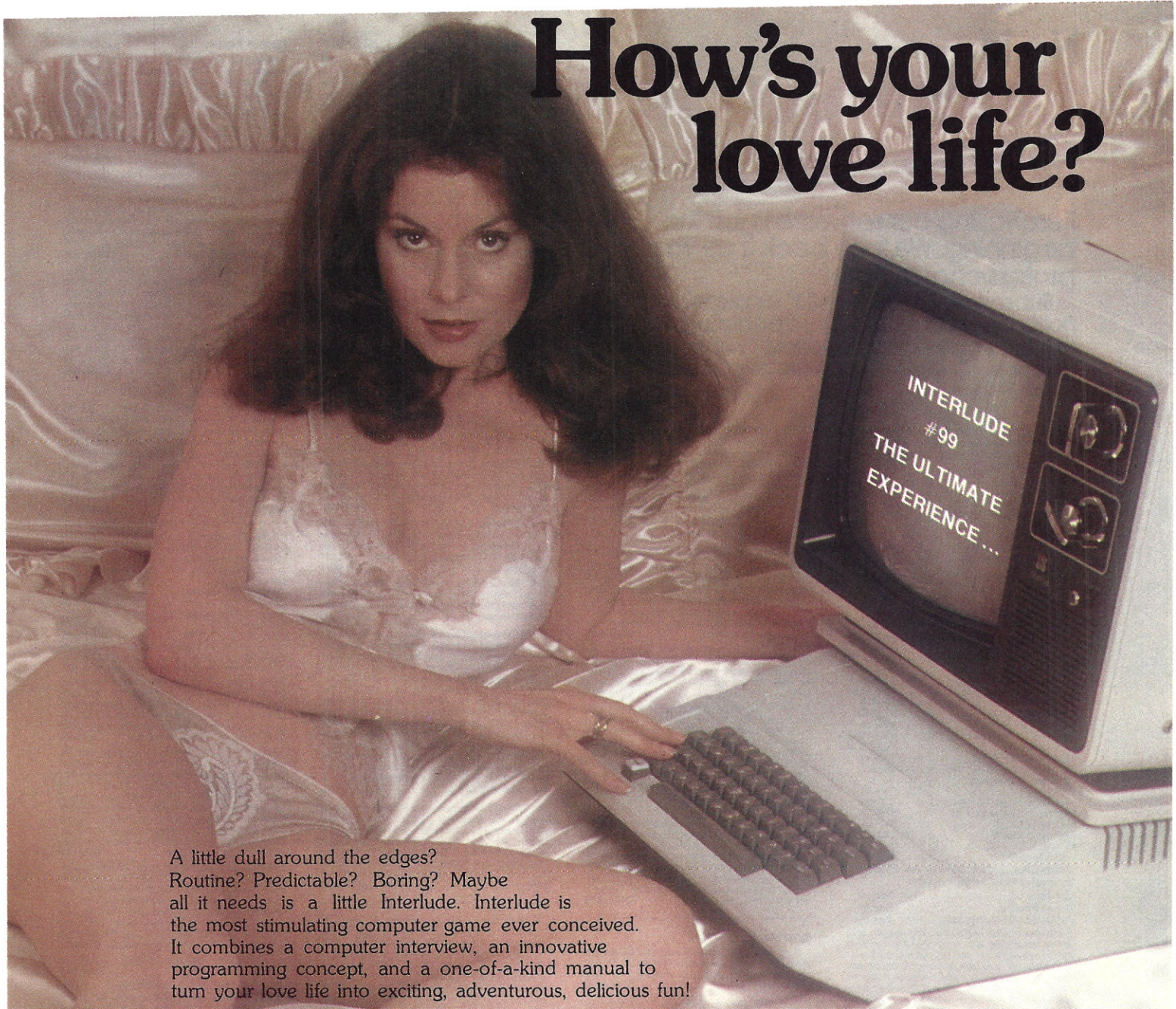
There is no provision for savings other than cash. In inflationary times, real estate investments, more or less like the home, would behave reasonably predictably.

It would seem that the interest rate on the home would better be a data item. The same holds for the information in line 122, which would not then have to be optional.

It would be useful to be able to print the inner loop, and perhaps the outer loop also, at small intervals, for example, five years.

(continued on page 227)

How's your love life?



A little dull around the edges? Routine? Predictable? Boring? Maybe all it needs is a little Interlude. Interlude is the most stimulating computer game ever conceived. It combines a computer interview, an innovative programming concept, and a one-of-a-kind manual to turn your love life into exciting, adventurous, delicious fun!

Interlude is: romantic... playful... outrageous... a fantasy. Interlude is: ■ A Bed of Roses (Interlude #1) ■ Mata Hari (Interlude #49) ■ The Chase (Interlude #7) ■ Rodeo! (Interlude #71) ■ The King and I (Interlude #60) ■ Some Enchanted Evening (Interlude #84) ■ Caveman Caper (Interlude #82) ■ From Here to Ecstasy (Interlude No. 30) ■ Satin Dreams (Interlude #72).

More than 100 Interludes are included in the program. Most are described in detail in the accompanying manual, but several surprise Interludes are buried in the program awaiting that very special time when your interview says you're ready. (When you learn secret Interlude #99, your love life may never again be the same!) Interlude can give you experiences you'll never forget. Are you ready for it?

Interlude™ ✓235
The Ultimate Experience.

INTERLUDE, 10428 Westpark, Houston, Texas 77042. I'm really ready. Send my Interlude today.

Apple II (16K)*
☐ Cassette ($16.95)
☐ Diskette ($19.95)
☐ Diskette—Pascal or DOS 3.3 ($19.95)
Add $1.50 for shipping and handling.

TRS-80 (Level II-16K)**
☐ Cassette ($16.95)
☐ Diskette ($19.95)

Poster
☐ 20"x 24" reproduction of this ad without ad copy ($4.95—includes shipping charges)

Available for immediate shipment.

Please enclose your check payable to INTERLUDE or complete the charge information:

☐ MASTERCARD ☐ VISA All charge customers must sign here._____
Account No. _____ Expiration date_____ MasterCard Bank Code _____

CHARGE CUSTOMERS: Order by phone toll-free! **1-800-231-5768 Ext. 306** (Texas: 1-800-392-2348 Ext. 306)
Name _____ Age _____
Address _____
City _____ State _____ Zip _____

*Apple II is a registered trademark of Apple Computers, Inc. **TRS-80 is a registered trademark of Radio Shack, a Tandy Co.

No.18
Software with full support

Purchasing our software is just the beginning. We then back it up with professional support:

■ Subscription to "LIFELINES" for automatic notifications of revisions! ■ Update service for software and documentation! ■ Telephone Hotline! ■ Overseas software export service!

All Lifeboat programs require CP/M, unless otherwise stated.

Software with Manual / Manual Alone

☐ **CP/M* FLOPPY DISK OPERATING SYSTEM**—Digital Research's operating system configured for many popular micro-computers and disk systems:

System	Version	Price
Apple II*	2.x	349/NA ◇
SoftCard* with Z80 Microsoft BASIC version 5 with high resolution graphics		
North Star Single Density	2.x	170/25 Ⓡ
North Star Double/Quad	2.x	170/25 Ⓡ
Durango F-85	2.x	170/25
iCOM Micro-Disk 2411	1.4	145/25
iCOM 3712 for MITS 88-2SIO Console	1.4	170/25 *
iCOM 3712 for 3P + S/MITS SIO Rev non-zero console	1.4	170/25 *
iCOM 3812	2.x	225/25 Ⓡ
iCOM 3812	1.4	170/25 *
iCOM 4511/Pertec D3000	2.x	375/25 *+
Mits 3202/Altair 8800	1.4	145/25
Heath H8 + H17	1.4	145/25 Ⓜ
Heath H89 by Magnolia	2.x	249/25 ◇
Ohio Scientific C3	2.x	200/25
Ohio Scientific C3-C	2.x	250/25
Onyx C8001 Standard	2.x	250/25
Onyx C8001 Enhanced	2.x	330/25
TRS-80 Model I	1.4	145/25 Ⓜ
TRS-80 Model II	2.x	170/25
TRS-80 Model II + Corvus Processor Technology	2.x	250/25
Helios II	1.4	145/25
Intel MDS Single Density	2.x	170/25
Intel MDS Double Density	2.x	170/25
New Micropolis Mod I	2.x	200/25 Ⓡ
New Micropolis Mod II	2.x	200/25 Ⓡ
Mostek MDX STD Bus System	2.x	350/25 **

HARD DISK OPTIONS (items with Ⓡ) when purchased with CP/M 2.X system.

Corvus ..... **Add 80.**
Konan Phoenix ..... **Add 80.**
iCOM 4511/Pertec D3000 ..... **Add 80.**

*Software consists of the operating system, text editor, assembler, debugger and other utilities for file management and system maintenance. Complete set of Digital Research's documentation and additional implementation notes included. Systems marked * and ** include firmware on 2708 and 2716. Systems marked + include 5440 media charge. Systems marked Ⓜ require the special Ⓜ versions of software in this catalog. ◇ includes hardware addition to allow our standard versions of software to run under it.*

☐ **Z80 DEVELOPMENT PACKAGE**—Consists Ⓜ of: (1) disk file line editor, with global inter and Ⓩ intra-line facilities; (2) Z80 relocating assembler, Zilog/Mostek mnemonics, conditional assembly and cross reference table capabilities; (3) linking loader producing absolute Intel hex disk file ..... **$95/$20**

☐ **ZDT**—Z80 Monitor Debugger to break and Ⓜ examine registers with standard Zilog/ Ⓩ Mostek mnemonic disassembly displays. $35 when ordered with Z80 Development Package ..... **$50/$10**

AVOCET SYSTEMS

☐ **XASM-68**—Non-macro cross-assembler with nested conditionals and full range of pseudo operations. Assembles from standard Motorola MC6800 mnemonics to Intel hex ... **$200/$25**

☐ **XASM-65**—As XASM-68 for MOS Technology MCS-6500 series mnemonics ..... **$200/$25**

☐ **XASM-48**—As XASM-68 for Intel MCS-48 and UPI-41 families ..... **$200/$25**

☐ **XASM-18**—As XASM-68 for RCA 1802 ..... **$200/$25**

☐ **DISTEL**—Disk based disassembler to Intel 8080 or TDL/Xitan Z80 source code, listing and cross reference files, Intel or TDL/Xitan pseudo ops optional. Runs on 8080 ..... **$65/$10**

☐ **DISILOG**—As DISTEL to Zilog/Mostek Ⓜ mnemonic files ..... **$65/$10** Ⓩ

☐ **SMAL/80** Structured Macro Assembler Ⓧ Language—Package of powerful general purpose text macro processor and SMAL structured language compiler. SMAL is an assembler language with IF-THEN-ELSE, LOOP-REPEAT-WHILE, DO-END, BEGIN-END constructs. Not compatible with CP/M version 2 or greater. ..... **$75/$15**

Software with Manual / Manual Alone

☐ **RAID**—8080/8085 debugging aid and general system utility program. Both a software emulator and real-time debug monitor. Features multiple breakpoints, symbolic input, symbolic display and altering of registers, built-in assembler & dis-assembler, tracing, single-stepping, memory protection, histograms, memory search, direct disk access. Requires 32K CP/M ..... **$250/$25**

PHOENIX SOFTWARE ASSOCIATES

☐ **PASM***—Z80 macro assembler, Intel/TDL Ⓩ mnemonics. Generates Intel hex format or relocatable code in either TDL Object Module format or PSA Relocatable Binary Module format. Supports text insertion, conditional branching within macros, recursive macro calls and parameter passing. ..... **$129/$25**

☐ **EDIT**—Character oriented text file editor. In- Ⓩ cludes macro definition capabilities. Handles insertion, deletion, searching, block move, etc. for files of any length. Does not require a CRT. ..... **$129/$25**

☐ **PLINK***—Two pass **disk-to-disk linkage edi- Ⓩ tor/loader** which can produce re-entrant, ROMable code. Can link programs that are larger than available memory for execution targeted on another machine. Full library capabilities. Input can be PSA Relocatable Binary Module, TDL Object Module or **Microsoft REL files**. Output can be a COM file, Intel hex file, TDL Object Module or PSA Relocatable file. ..... **$129/$25**

☐ **BUG* and μBUG***—Z80 interactive machine Ⓩ level debugging tools for program development. BUG has full mnemonic trace and interactive assembly (mnemonics compatible with PASM). Dynamic breakpoints and conditional traps while tracing (even through ROM!). μBUG is a subset of BUG and is used in memory limited situations ..... **$129/$25**

DIGITAL RESEARCH

☐ **MP/M**—Installed for single density MDS-800. Multi-processing derivative of the CP/M operating system. Manual includes CP/M2 documentation ..... **$300/$50**

☐ **MAC**—8080 Macro assembler. Full Intel macro Ⓢ definitions. Pseudo Ops include RPC, IRP, REPT, TITLE, PAGE, and MACLIB. Produces absolute hex output plus symbol table file for use by SID and ZSID (see below) .. **$120/$15**

☐ **SID**—8080 Symbolic debugger. Full trace, Ⓢ pass count and breakpoint program testing. Has backtrace and histogram utilities. When used with MAC, provides full symbolic display of memory labels and equated values .**$105/$15**

☐ **ZSID**—Z80 Symbolic debugger with all fea- Ⓢ tures of SID ..... **$130/$15** Ⓩ

☐ **TEX**—Text output formatter to create paginat- Ⓢ ed, page-numbered and justified copy. Output can be directed to printer or disk ... **$105/$15**

☐ **DESPOOL**—Utility program to permit simulta- Ⓢ neous printing from text files while executing other programs ..... **$80/$10**

☐ **tiny C**—Interactive interpretive system for Ⓧ teaching structured programming techniques. Manual includes full source listings .**$105/$50**

☐ **BDS C COMPILER**—Supports structures, Ⓜ unions, 2 dimensional arrays, pointers, recur- Ⓘ sion and overlays. Features optimized code generator, variable sized buffers for file I/O, and capability to produce ROMable code. Includes macro package to enable user to produce linkable modules with MAC (see under Digital Research). Floating point functions, full run-time package and machine code library sources provided. Linker, library manager and textbook included. Compiler lacks initializers, statics, floats and longs. ..... **$145/$25**

☐ **WHITESMITHS C COMPILER**—The ultimate Ⓛ in systems software tools. Produces faster Ⓧ code than a pseudo-code Pascal with more extensive facilities. Conforms to the full UNIX* Version 7 C language, described by Kernighan and Ritchie, and makes available over 75 functions for performing I/O, string manipulation and storage allocation. Linkable to Microsoft REL files. Requires 60K CP/M ..... **$630/$30**

Software with Manual / Manual Alone

MICROSOFT

☐ **BASIC-80**—Disk Extended BASIC, ANSI Ⓛ compatible with long variable names, Ⓜ WHILE/WEND, chaining, variable length file records. MBASIC version 4.51 also included on disk. ..... **$325/$25**

☐ **BASIC COMPILER**—Language compatible Ⓛ with BASIC-80 and 3-10 times faster execution. Ⓜ Produces standard Microsoft relocatable, binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules ..... **$350/$25**

☐ **FORTRAN-80**—ANSI 66 (except for COM- Ⓛ PLEX) plus many extensions. Includes relocat- Ⓜ able object compiler, linking loader, library with manager. Also includes MACRO-80 (see below) ..... **$425/$25**

☐ **COBOL-80**—Level 1 ANSI '74 standard plus Ⓛ most of Level 2. Full sequential, relative, and Ⓜ indexed file support with variable file names. Powerful interactive, formatted screen handling with ACCEPT and DISPLAY verbs. Program segmentation for execution of programs larger than memory and CHAIN command with parameter passing. Full support of CP/M version 2 files. Includes MACRO-80 (see above), linking loader, and relocatable library manager. Requires 48K CP/M ..... **$700/$25**

New ☐ **M/SORT**—Optional sort/merge capability for Ⓛ COBOL-80 which conforms fully to SORT/ MERGE, Level II of the 1974 ANSI COBOL standard (except COLLATING SEQUENCE IS alphabet-name). Requires COBOL-80. Sold as an update to COBOL-80 ..... **$150/$10** COBOL-80 + M/SORT ..... **$825/$35**

☐ **MACRO-80**—8080/Z80 Macro Assembler. Ⓛ Intel and Zilog mnemonics supported. Relocat- Ⓜ able linkable output. Loader, Library Manager and Cross Reference List utilities included ..... **$149/$15**

☐ **XMACRO-86**—8086 cross assembler. All Ⓛ Macro and utility features of MACRO-80 package. Mnemonics slightly modified from Intel ASM86. Compatibility data sheet available ..... **$275/$25**

☐ **EDIT-80**—Very fast random access text editor Ⓛ for text with or without line numbers. Global and intra-line commands supported. File compare utility included. ..... **$89/$15**

☐ **muSIMP/muMATH**—muSIMP is a high level Ⓛ programming language suitable for symbolic and semi-numerical processing implemented using a fast and efficient interpreter requiring only 7K bytes of machine code. muMATH is a package of programs written in muSIMP. The package performs sophisticated mathematical functions. Keeps track of up to 611 digits. Performs matrix operations on arrays: transpose, multiply, divide, inverse and other integer powers. Logarithmic, exponential, trigonometric simplification and transformation, symbolic differentiation with partial derivatives, symbolic integration of definite and indefinite integrals. Requires 40K CP/M ..... **$250/$20**

☐ **muLISP-80**—Microcomputer implementation Ⓛ of LISP. The interpreter resides in only 7K bytes of memory yet includes 83 LISP functions. Has infinite precision integer arithmetic expressed in any radix from 2 to 36. muLISP80 includes complete trace facility and a library of useful functions and entertaining sample programs ..... **$200/$15**

☐ **PASCAL/M***—Compiles enhanced Standard Ⓧ Pascal to compressed efficient Pcode. Totally CP/M compatible. Random access files. Both 16 and 32-bit Integers. Runtime error recovery. Convenient STRINGs. OTHERWISE clause on CASE. Comprehensive manual (90 pp. indexed). SEGMENT provides overlay structure. INPORT, OUTPORT and untyped files for arbitrary I/O. Requires 56K CP/M. Specify 1) 8080 CP/M, 2) Z80 CP/M, or 3) Cromemco CDOS. ..... **$175/$20**

☐ **PASCAL/Z**—Z80 native code PASCAL com- Ⓘ piler. Produces optimized, ROMable re-entrant Ⓩ code. All interfacing to CP/M is through the support library. The package includes compiler, relocating assembler and linker, and source for all library modules. Variant records, strings and direct I/O are supported. Requires 56K CP/M ..... **$395/$25**

☐ **PASCAL/MT**—Subset of standard PASCAL. Ⓜ Generates ROMable 8080 machine code. Ⓧ Symbolic debugger included. Supports interrupt procedures, CP/M file I/O and assembly language interface. Real variables can be BCD, software floating point, or AMD 9511 hardware floating point. Includes strings enumerations and record data types. Manual explains BASIC-PASCAL conversion. Requires 32K .**$250/$30**

☐ **APL/V80**—Concise and powerful language for Ⓩ application software development. Complex programming problems are reduced to simple expressions in APL. Features include up to 27K active workspace, shared variables, arrays of up to 8 dimensions, disk workspace and copy object library. The system also supports auxiliary processors for interfacing I/O ports. Requires 48K CP/M and serial APL printing terminal or CRT ..... **$500/$30**

☐ **ALGOL-60**—Powerful block-structured lan- Ⓩ guage compiler featuring economical run-time dynamic allocation of memory. Very compact (24K total RAM) system implementing almost all Algol 60 report features plus many powerful extensions including string handling direct disk address I/O etc. ..... **$199/$20**

☐ **CBASIC-2** Disk Extended BASIC—Non- Ⓜ interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file control, chaining, integer and extended precision variables, etc. Versions of CRUN for CP/M versions 1.4 and 2.x included on disk. .. **$120/$15**

Software with Manual / Manual Alone

MICRO FOCUS

☐ **STANDARD CIS COBOL**—ANSI '74 COBOL Ⓛ standard compiler fully validated by U.S. Navy tests to ANSI level 1. Supports many features to level 2 including dynamic loading of COBOL modules and a full ISAM file facility. Also, program segmentation, interactive debug and powerful interactive extensions to support protected and unprotected CRT screen formatting from COBOL programs used with any dumb terminal ..... **$850/$50**

☐ **FORMS 2**—CRT screen editor. Output is Ⓛ COBOL data descriptions for copying into CIS COBOL programs. Automatically creates a query and update program of indexed files using CRT protected and unprotected screen formats. No programming experience needed. Output program directly compiled by STANDARD CIS COBOL ..... **$200/$20**

New ☐ **NEVADA COBOL**—Subset of ANSI-74. Fea- Ⓜ tures fast compilation and execution with small object modules. Has extended arithmetic with 18 digit accuracy. Extended I/O includes random access files and sequential files of both fixed and variable length records, and interactive accept/display verbs. Good error messages and debugging facilities enhance program development. Requires a 32K CP/M system ..... **$149/$25**

EIDOS SYSTEMS

☐ **KBASIC**—Microsoft Disk Extended BASIC Ⓛ version 4.51 integrated with KISS Multi-Keyed Index Sequential and Direct Access file management as 9 additional BASIC commands. KISS included as relocatable modules linkable to FORTRAN-80, COBOL-80, and BASIC COMPILER. Specify CP/M version 1.4 or 2.x when ordering. Requires 48K CP/M **$585/$45** To licensed users of Microsoft BASIC-80 (MBASIC) ..... **$435/$45**

☐ **XYBASIC** Interactive Process Control BASIC—Full disk BASIC features plus unique commands to handle byte rotate and shift and to test and set bits. Available in several versions:

Integer ROM squared	$350/$25
Integer CP/M	$350/$25
Extended ROM squared	$450/$25
Extended CP/M	$450/$25
Extended Disk CP/M	$550/$25
Integer CP/M Run Time Compiler	$350/$25
Extended CP/M Run Time Compiler	$450/$25

☐ **RECLAIM**—A utility to validate media under CP/M. Program tests a diskette or hard disk surface for errors, reserving the imperfections in invisible files, and permitting continued usage of the remainder. Essential for any hard disk. Requires CP/M version 2. ..... **$80/$5**

☐ **BASIC UTILITY DISK**—Consists of: (1) Ⓜ CRUNCH-14— Compacting utility to reduce the size and increase the speed of programs in Microsoft BASIC 4.51, BASIC-80 and TRS-80 BASIC. (2) DPFUN—Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sine, arc sine, hyperbolic sine, hyperbolic arc sine, etc. Furnished in source on diskette and documentation ..... **$50/$35**

☐ **STRING/80**—Character string handling plus routines for direct CP/M BDOS calls from FORTRAN and other compatible Microsoft languages. The utility library contains routines that enable programs to chain to a COM file, retrieve command line parameters and search file directories with full wild card facilities. Supplied as linkable modules in Microsoft format. **$95/$20**

☐ **STRING/80** source code available separately— **$295/NA**

☐ **THE STRING BIT**—FORTRAN character Ⓜ string handling. Routines to find, fill, pack, move, separate, concatenate and compare character strings. This package completely eliminates the problems associated with character string handling in FORTRAN. Supplied with source ..... **$65/$15**

☐ **VSORT**—Versatile sort/merge system for fixed Ⓜ length records with fixed or variable length fields. VSORT can be used as a stand-alone package or loaded and called as a subroutine from CBASIC-2. When used as a subroutine, VSORT maximizes the use of buffer space by saving the TPA on disk and restoring it on completion of sorting. Records may be up to 255 bytes long with a maximum of 5 fields. Upper/lower case translation and numeric fields supported. ..... **$175/$20**

New ☐ **IBM/CPM**—Program to transfer IBM 3741 data set files to CP/M files or CP/M files to IBM 3741 data sets. Easy to use. Requires two eight inch diskette drives, 24K memory, and a 24 by 80 CRT terminal ..... **$175/$5**

CPAids*

☐ **MASTER TAX**—Professional tax preparation Ⓛ program. Prepares schedules A, B, C, D, E, F, † G, R/RP, SE, TC, ES and forms 2106, 2119, 2210, 3468, 3903, 2441, 4625, 4726, 4797, 4972, 5695 and 6251. Printing can be on readily available, pre-printed continuous forms, on overlays, or on computer generated, IRS approved forms. Maintains client history files and is interactive with CPAids GENERAL LEDGER II (see below) ..... **$995/$30** Annual Update Fee **$350**

☐ **STANDARD TAX**—As above for schedules A, † B, C, D, E, G, R/RP, SE, TC and forms 2106 and 2441. Also, does not maintain client history files ..... **$495/$30** Annual Update Fee **$175**

Copyright © 1980 Lifeboat Associates. No portion of this advertisement may be reproduced without prior permission.

Software with Manual / Manual Alone

☐ **GENERAL LEDGER II**— Designed for CPA's. † Stores complete 12 month detailed history of transactions. Generates financial statements, depreciation, loan amortizations, journals, trial balances, statements of changes in financial position, and compilation letters. Includes payroll system with automatic posting to general ledger. Prints payroll register, W2's and payroll checks. ..... **$450/$30**

☐ **T/MAKER**— Powerful new tool for preparing management reports with tabular data. Makes financial modeling projects easy. Do you want a weekly profitability report? Set up the table and compute. Just change the sales figures for next week and compute. You have a new report! T/MAKER includes a full screen editor for setting up tables which pages left, right, up and down. Compute includes standard arithmetic, percents, exponents, common transcendental functions, averages, maxima, minima, projections, etc. Requires 48K CP/M, CBASIC-2, CRT terminal with addressable cursor positioning. ..... **$275/$25**

☐ **ESQ-1**— Professional time and billing for the Ⓛ legal profession. Designed for use by the first- † time computer user. Records billable and non- billable time. Complete system includes transaction entry, posting, billing, reports, and client analysis. Records cash receipts, escrow receipts, and escrow transfers. Requires 48K CP/M system, 480K of disk storage space, cursor addressable CRT, and CBASIC-2 .... **$1495/$50**

New

☐ Complete demonstration system for ESQ-1 Ⓛ ..... **$75/$50** †

☐ **BSTAM**— Utility to link one computer to another Ⓜ also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it! It's great! Full wildcard expansion to send *. COM, etc. 9600 baud with wire. 300 baud with phone connection. **Both** ends need one. Standard and Ⓜ versions can talk to one another. This software requires a knowledge of assembler language for installation. ..... **$150/$10**

☐ **BSTMS**— Intelligent terminal program for Ⓜ CP/M systems. Permits communication between micros and mainframes. Sends character data files to remote computers under complete control. System can record character data sent from remote computer systems and data banks. Includes programs to EXPAND and COMPRESS binary files for transmission. This software requires a knowledge of assembler language for installation. ..... **$200/$25**

New

☐ **WHATSIT?***— Interactive data-base system using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC-2 . **$175/$25**

☐ **SELECTOR III-C2**— Data Base Processor to † create and maintain multi-key data bases. Ⓜ Prints formatted sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC-2. Supplied in source ..... **$295/$20**

☐ **GLECTOR**— General Ledger option to SELECTOR III-C2. Interactive system provides for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L statements and journals. Two year record allows for statement of changes in financial position report. Supplied in source. Requires SELECTOR III-C2. CBASIC-2 and 56K system. ..... **$350/$25**

☐ **MAGSAM III**— Sophisticated keyed access file Ⓛ support system. Supports random, sequential, and generic retrieval by key. Also, multiple secondary keys. Dynamic allocation and extension of files with automatic free space reclamation. Interactive tutorial included to get the user started. Complete with documentation and quick reference card. Specify CBASIC or Microsoft BASIC version. Requires 48K system ..... **$145/$25**

New

☐ **MAGSAM IV**— High speed machine code ver- Ⓛ sion of MAGSAM III for CBASIC only. Distrib- uted as pre-loaded modules and Microsoft relocatable object modules ..... **$295/$25**

New

DMA

☐ **CBS**— Configurable Business System is a † comprehensive set of programs for defining custom data files and application systems without using a programming language such as BASIC, FORTRAN, etc. Multiple key fields for each data file are supported. Set-up program customizes system to user's CRT and printer. Provides fast and easy interactive data entry and retrieval **with transaction processing**. Report generator program does complex calculations with stored and derived data, record selection with multiple criteria, and custom formats. Sample inventory and mailing list systems included. **No support language required** ..... **$395/$40**

MICROPRO

☐ **SUPER-SORT I**— Sort, merge, extract utility as Ⓛ absolute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD. Packed Decimal, EBCDIC, ASCII, floating & fixed point, exponential, field justified, etc. Even variable number of fields per record! ..... **$225/$25**

☐ **SUPER-SORT II**— Above available as abso- Ⓛ lute program only ..... **$175/$25**

☐ **SUPER-SORT III**— As II without SELECT/ Ⓛ EXCLUDE ..... **$125/$25**

Software with Manual / Manual Alone

☐ **DATASTAR**— Professional forms control entry Ⓛ and display system for key-to-disk data capture. Menu driven with built-in learning aids. Input field verification by length, mask, attribute (i.e. upper case, lower case, numeric, auto-dup, etc.). Built-in arithmetic capabilities using keyed data, constant and derived values. Visual feedback for ease of forms design. Files compatible with CP/M-MP/M supported languages. Requires 32K CP/M and CRT with addressable cursor. ..... **$350/$35**

☐ **WORD-STAR**— Menu driven visual word pro- Ⓛ cessing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning ..... **$445/$40**

☐ **WORD-STAR-MAIL-MERGE**— As above with Ⓛ option for production mailing of personalized documents with mail lists from DATASTAR or NAD ..... **$575/$40**

☐ **WORD-MASTER** Text Editor— In one mode Ⓛ has superset of CP/M's ED commands including global searching and replacing, forwards and backwards in file in video mode, provides full screen editor for users with serial addressable-cursor terminal ..... **$145/$25**

☐ **MAGIC WAND***— Word processing system with simple, easy to use full screen text editor and powerful print processor. Editor has all standard editing functions including text insert and delete, global search and replace, block move and library files for boiler plate text. Print processor formatting commands include automatic margins, pagination, headings & footings, centered and justified text. Also prints with true proportional spacing, merges with data files for automatic form letters, and performs run-time conditional testing for varied output. Requires 32K CP/M and CRT terminal with addressable cursor. ..... **$395/$40**

☐ **TEXTWRITER III**— Text formatter to justify and Ⓜ paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Pencil* and Word-Star prepared files ..... **$125/$20**

☐ **DATEBOOK**— Program to manage time just like an office appointment book but using the speed and memory of a computer. Keeps track of three appointment schedules (three dental chairs, three attorneys, etc.) at once. Appointments consist of name, reason for the appointment, the date and time, and the length of the appointment. System can be quickly customized for the individual user. Many helpful features for making, changing, finding, and reporting appointments. Requires 48K CP/M and 180K bytes diskette storage. Requires 80×24 cursor addressable terminal. Specify 8080 CP/M, Z80 CP/M or Cromemco CDOS. ..... **$295/$25**

New

PEACHTREE SOFTWARE*

☐ General accounting software for small busi- Ⓛ nesses. Each product can be used alone or with † automatic posting to the General Ledger. Supplied in source for Microsoft BASIC 4.51.

GENERAL LEDGER	**$530/$40**
ACCOUNTS PAYABLE	**$530/$40**
ACCOUNTS RECEIVABLE	**$530/$40**
PAYROLL	**$530/$40**
INVENTORY	**$660/$40**

☐ Other application products supplied in source Ⓛ for Microsoft BASIC 4.51.

† MAILING ADDRESS	**$530/$40**
PROPERTY MANAGEMENT	**$925/$40**

GRAHAM-DORIAN SOFTWARE SYSTEMS

☐ Comprehensive accounting software written in Ⓛ CBASIC-2 and supplied in source code. Each Ⓜ software package can be used as a stand- † alone system or integrated with the General Ledger for automatic posting to ledger accounts. Requires CBASIC-2.

GENERAL LEDGER	**$805/$40**
ACCOUNTS PAYABLE	**$805/$40**
ACCOUNTS RECEIVABLE	**$805/$40**
INVENTORY SYSTEM	**$555/$40**
JOB COSTING	**$805/$40**
APARTMENT MANAGEMENT	**$805/$40**
CASH REGISTER	**$805/$40**

☐ **POSTMASTER**— A comprehensive package Ⓜ for mail list maintenance that is completely menu driven. Features include keyed record extraction and label production. A form letter program is included which provides neat letters on single sheet or continuous forms. Includes NAD file translator. Requires CBASIC-2. ..... **$150/$20**

STRUCTURED SYSTEMS GROUP

☐ Complete interactive accounting software for † business. Each product can be used stand- alone or with automatic posting to the general ledger. Each product is thoroughly tested and very well documented.

GENERAL LEDGER	**$820/$40**
ACCOUNTS RECEIVABLE	**$820/$40**
ACCOUNTS PAYABLE	**$820/$40**
PAYROLL	**$820/$40**
INVENTORY CONTROL	**$820/$40**

Software with Manual / Manual Alone

☐ **ANALYST**— Customized data entry and report- † ing system. User specifies up to 75 data items per record. Interactive data entry, retrieval, and update facility makes information management easy. Sophisticated report generator provides customized reports using selected records with multiple level breakpoints for summarization. Requires a disk sort utility such as QSORT, SUPER-SORT or VSORT and CBASIC-2 ..... **$250/$15**

☐ **LETTERIGHT**— Program to create, edit and type letters or other documents. Has facilities to enter, display, delete and move text, with good video screen presentation. Integrates with NAD for form letter mailings. ..... **$200/$25**

☐ **NAD**— Name and Address selection system. Interactive mail list creation and maintenance program with output as full reports with reference data or restricted information for mail labels. Transfer system for extraction and transfer of selected records to create new files. QSORT required if sorting is desired. **$100/$20**

☐ **QSORT**— Fast sort/merge program for files with fixed record length; variable field length information. Up to five ascending or descending keys. Full back-up of input files created ..... **$100/$20**

★ ★ ★ ★ ★ ★ ★

☐ **HEAD CLEANING DISKETTE**— Cleans the drive Read/Write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use. Specify 5" or 8".
Single sided ..... **$20 each/$55 for 3**
Double sided ..... **$25 each/$65 for 3**

LIFELINES
NEWSLETTER FROM LIFEBOAT

LIFELINES is the first step in software support for the serious microcomputer user. Each issue reports new revisions together with information on the purpose for each such release, be it for correction of "bugs" or the addition of features and facilities.

Feature Articles ! New Software ! Product Comparisons ! Info on CP/M Users Group !

SUBSCRIPTION INFORMATION:

$18 for twelve issues: U.S., Canada, and Mexico.
$40 for twelve issues: all other countries.
$2.50 for each back issue: U.S., Canada, and Mexico.
$3.60 for each back issue: all other countries.

Send Check to LIFELINES, 1651 Third Avenue, New York, N.Y. 10028 or use your VISA or MASTERCARD—call (212) 722-1700

☐ **DC 300 Data Cartridges** Specify 450 'XL or 300' certified. Pack of 5. ..... **$100**

☐ **FLIPPY DISK KIT**— Template and instructions to modify single sided 5¼" diskettes for use of second side in single sided drives **$12.50**

☐ **FLOPPY SAVER**— Protection for center holes for 5" and 8" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool and tough 7 mil mylar reinforcing rings for 25 diskettes.

5", Kit	**$14.95**
5", Rings only	**$7.95**
8", Kit	**$16.95**
8", Rings only	**$8.95**

New

☐ **The CP/M HANDBOOK** (with MP/M) by Rodnay Zaks **$13.95**

☐ **PASCAL USER MANUAL AND REPORT**— By Jensen and Wirth. The standard textbook on the language. Recommended for use by Pascal/Z, Pascal/M and Pascal/MT users **$12**

☐ **THE C PROGRAMMING LANGUAGE**— By Kernighan and Ritchie. The standard textbook on the language. Recommended for use by BDS C, tiny C, and Whitesmiths C users . . **$12**

☐ **STRUCTURED MICROPROCESSOR PROGRAMMING**— By the authors of SMAL/80. Covers structured programming, the 8080/8085 instruction set and the SMAL/80 language **$20**

☐ **ACCOUNTS PAYABLE & ACCOUNTS RECEIVABLE– CBASIC** book by Osborne/McGraw-Hill **$20**

☐ **GENERAL LEDGER– CBASIC** book by Osborne/McGraw-Hill **$20**

☐ **PAYROLL WITH COST ACCOUNTING– CBASIC** book by Osborne/McGraw-Hill . . **$20**

★ ★ ★ ★ ★ ★ ★

* Program names trademarked

† Recommended system configuration consists of 48K CP/M, 2 full size disk drives, 24 x 80 CRT and 132 column printer.

Ⓜ Modified version available for use with CP/M as implemented on Heath and TRS-80 Model I computers.

Ⓛ User license agreement for this product must be signed and returned to Lifeboat Associates before shipment may be made.

Ⓘ This product Includes/eXcludes the language Ⓧ manual recommended in Condiments.

Ⓢ Serial number of CP/M system must be supplied with orders.

② Requires Z80 CPU.

★ ★ ★ ★ ★ ★ ★ ★

Ordering Information

MEDIA FORMAT ORDERING CODES.
When ordering, please specify format code.

LIFEBOAT ASSOCIATES MEDIA FORMATS LIST. Diskette, cartridge disk and cartridge tape format codes to be specified when ordering software for listed computer or disk systems. All software products have specific requirements in terms of hardware or software support, such as MPU type, memory size, support operating system or language.

Computer system	Format Code
Altair 8800 Disk	See MITS 3200
Altos	A1*
Apple + SoftCard 13 Sector	RG
Apple + SoftCard 16 Sector	RR
AVL Eagle	RB
BASF System 7100	RD
Blackhawk Single Density	Q3
Blackhawk Micropolis Mod II	Q2
CDS Versatile 3B	Q1
CDS Versatile 4	Q2
COMPAL-80	Q2
Cromemco System 3	A1*
Cromemco Z2D	R6
CSSN BACKUP (tape)	T1#
Delta	A1*
Digi-Log Microterm II	RD
Digital Microsystems	A1*
Discus	See Morrow Discus
Durango F-85	RL
Dynabyte DB8/2	R1
Dynabyte DB8/4	A1*
Exidy Sorcerer + Lifeboat CP/M	Q2
Exidy Sorcerer + Exidy CP/M	Q4
Heath H8 + H17/H27	P4
Heath H89 + Lifeboat CP/M	P4
Heath H89 + Magnolia CP/M	P7
Helios II	See Processor Technology
Horizon	See North Star
iCOM 2411 Micro Floppy	R3
iCOM 3712	A1
iCOM 3812	A1*
iCOM 4511 5440 Cartridge CP/M 1.4	D1#
iCOM 4511 5440 Cartridge CP/M 2.2	D2#
IMS 5000	RA
IMS 8000	A1*
IMSAI VDP-40	R4**
IMSAI VDP-42	R4**
IMSAI VDP-44	R5**
IMSAI VDP-80	A1**
Intecolor	See ISC Intecolor
Intel MDS Single Density	A2
Intel MDS Double Density	A5
Intertec SuperBrain DOS 0.1	R7
Intertec SuperBrain DOS 0.5-2.X	RJ
Intertec SuperBrain DOS 3.X	RK
ISC Intecolor 8063/8360/8963	A1
Kontron PSI-80	RF
Meca 5¼"	P6
Micromation (Except TRS-80 below)	A1*
Micropolis Mod I	Q1
Micropolis Mod II	Q2
MITS 3200/3202	B1
Morrow Discus	A1*
Mostek	A1
MSD 5¼"	RC
North Star Single Density	P1
North Star Double/Quad	P2
Nylac Single Density	Q3
Nylac Micropolis Mod. II	Q2
Ohio Scientific C3	A3
Onyx C8001	T2#
Pertec PCC 2000	A1*
Processor Technology Helios II	B2
Quay 500	RO
Quay 520	RP
RAIR Single Density	R9
RAIR Double Density	RE
Research Machines 8"	A1
Research Machines 5¼"	RH
REX	Q3
Sanco 7000 5¼"	RQ
SD Systems 8"	A1*
SD Systems 5¼"	R3
Sorcerer	See Exidy Sorcerer
Spacebyte	A1
SuperBrain	See Intertec
Tarbell	A1*
TEI 5¼"	R3
TEI 8"	A1*
Thinkertoys	See Morrow Discus
TRS-80 Model I 5¼"	R2
TRS-80 Model I + FEC Freedom	RN
TRS-80 Model I + Micromation	A4*
TRS-80 Model I + Omikron 5¼"	RM
TRS-80 Model I + Omikron 8"	A1
TRS-80 Model I + Shuffleboard 8"	A1
TRS-80 Model II	A1*
VDP-40/42/44/80	See IMSAI
Vector Graphic	Q2
Vector MZ	Q2
Versatile	See CDS Versatile
Vista V80 5¼" Single Density	P5
Vista V200 5¼" Double Density	P6
Zenith Z89 + Lifeboat CP/M	P4
Zenith Z89 + Magnolia CP/M	P7

Prices reflect distribution on 8" single density diskettes. If a format is requested which requires additional diskettes, a surcharge of $8. per additional diskette will be added.

Prices F.O.B. New York. Shipping, handling and C.O.D. charges extra.

Manual cost applicable against price of subsequent software purchase.

The sale of each proprietary software package conveys a license for use on one system only.

VISA MasterCard

* Single-Side Single-Density disks are supplied for use with Double-Density and Double-Side 8" soft sector format systems.

** IMSAI formats are single density with directory offset of zero.

\# A media surcharge of $25 for orders on tape formats T1 and T2 and of $100 for orders on disk formats D1 and D2 will be added.

The list of available formats is subject to change without notice. In case of uncertainty, call to confirm the format code for any particular equipment.

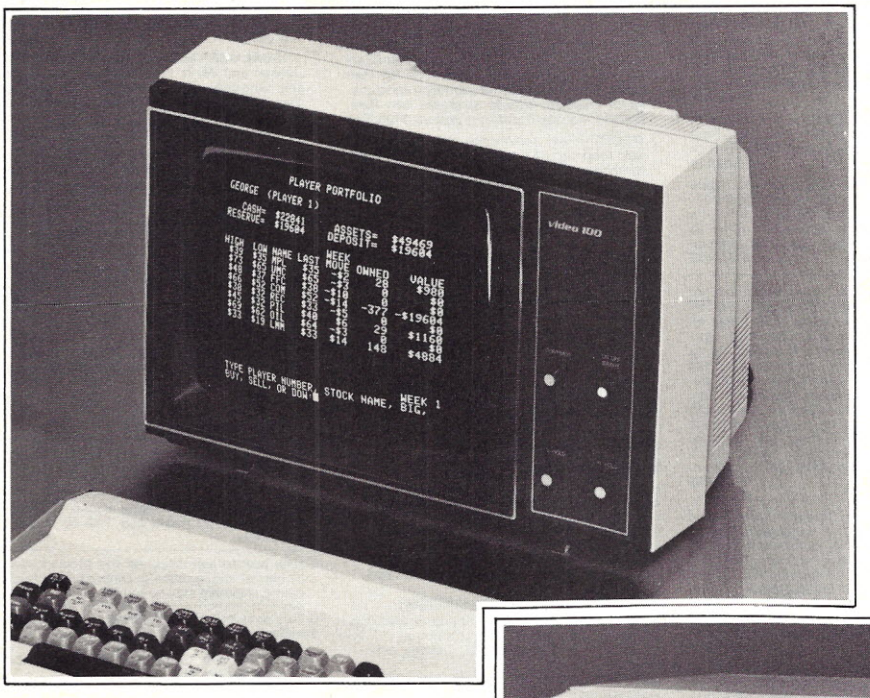


™

Lifeboat Associates, 1651 Third Avenue, N.Y., N.Y. 10028 **(212) 860-0300**
International Telex: 220501, Domestic Telex: 640693

™*The Software Supermarket is a trademark of Lifeboat Associates*

PROFESSIONAL B/W MONITORS
Designed for industry...priced for the home.



video 100

The video 100 computer monitors are ideal for all your personal and business needs. These highly reliable 12" black and white monitors feature a 12 MHz band width and 80 character by 24 line display. Plug-in compatability with Apple, Atari, Radio Shack, O.S.I., Micro-Term and Exidy make these the perfect text display for almost any system.

Sturdy, lightweight plastic cabinet

UNDER $170.00

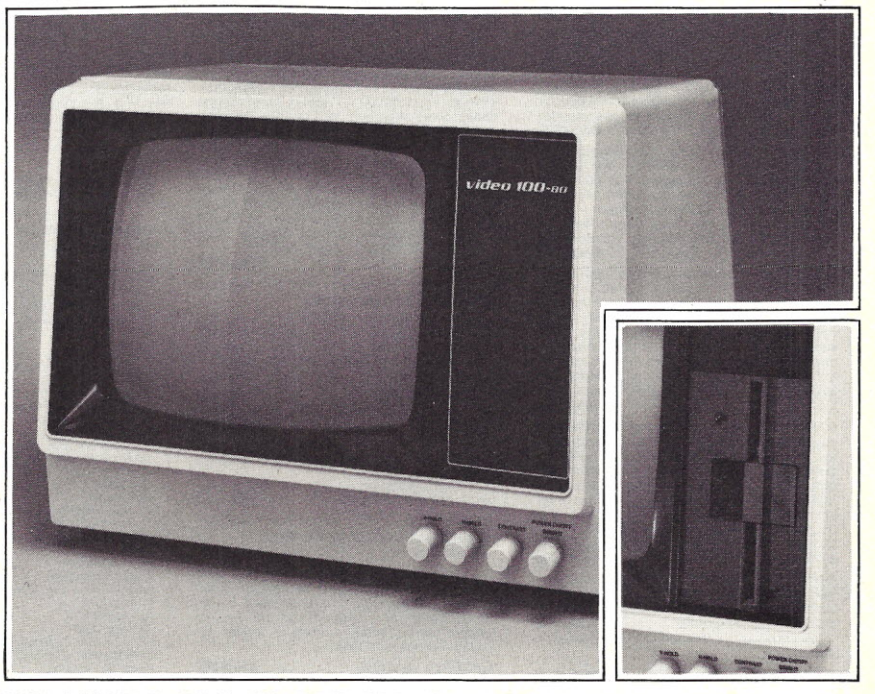
video 100-80

The model 80 features an industrial grade metal cabinet with built-in disk mounting capability and space for an 11" x 14" PC board for custom designed electronics.

The solid state circuitry assures a sharp, stable, and trouble-free picture. The front panel controls include power, contrast, horizontal hold, vertical hold, and brightness. Adjustments for size, video level, and width are located on the rear panel.

Rugged metal cabinet with disk space

UNDER $200.00



VIDEO 100 AND VIDEO 100-80 SPECIFICATIONS

- 12" diagonal measure display
- Convenient front panel controls
- Video bandwidth 12MHz ±3 DB
- Input impedance 75 Ohms
- 80 character by 24 line display
- 90° deflection picture tube
- Video 100-80 provides mounting space for mini floppy disk.
- Resolution—Over 700 lines at center horizontally—over 350 lines at center vertically

AMDEK CORP. the new name for **Leedex Corp.** ✓59

2420 East Oakton • Suite E • Arlington Heights, Ill. 60005 (312) 364-1180 • TLX: 25-4786

Dealer discount available

Put 16 bits on the S-100 bus with Marinchip Systems' M9900 CPU board.

Assemble a Super Business System

By Dr. Tom Lukers

I had no intentions of building an entire system from scratch.

I was already using a portable 6800-based system that included 40K RAM, triple minifloppies, an ADM-3A terminal and a quality printer, along with a very good text editor/processor package and a variety of custom software. It was, and still is, a good system.

But I needed an additional system for a variety of reasons.

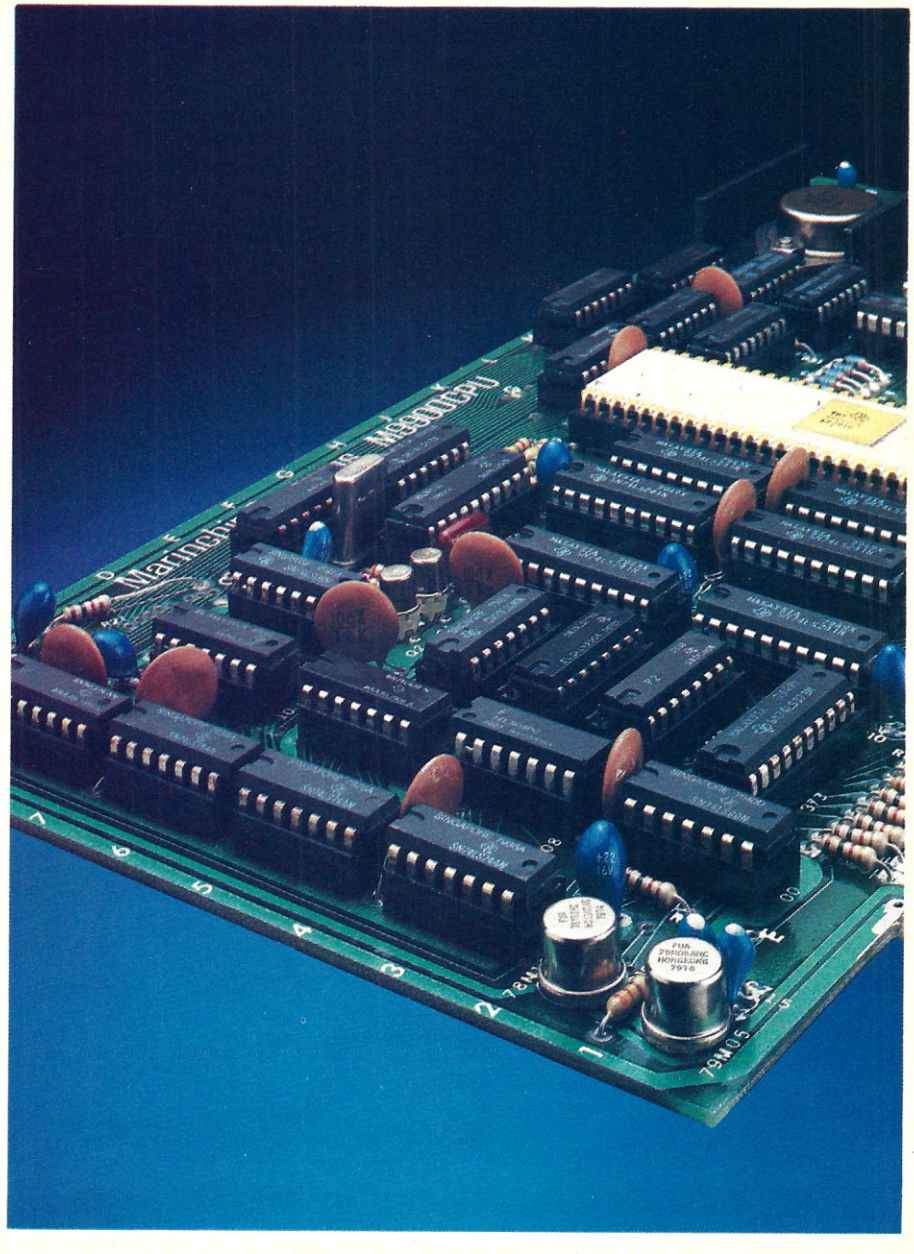
First, I wanted a powerful 16-bit computer with a good text editor/processor and a multitasking, multiuser operating system. I wanted a system that I could use with only one terminal and one printer, but that was easily expandable to run with several terminals, printers and other peripherals. I wanted to be sure that the software was already developed for driving a hard disk drive of at least ten megabytes.

And I wanted as standard system software the ability to use a modem to communicate with clients' mainframes, which requires some pretty good software.

These were not my only considerations. I also wanted to move into 16-bit technology with a chip family from a long-time computer manufacturer. Next, I hoped to investigate new technology as it came along. Finally, I wanted to be able to select peripherals and accessories from a wide range of manufacturers.

This article describes my solution—a 16-bit computer based on a Marinchip Systems M9900 CPU board run

Dr. Tom Lukers, 3625 Hendrick Drive, Plano, TX 75074.



Marinchip Systems' M9900 CPU Board. *(Photo by Martin Paul.)*



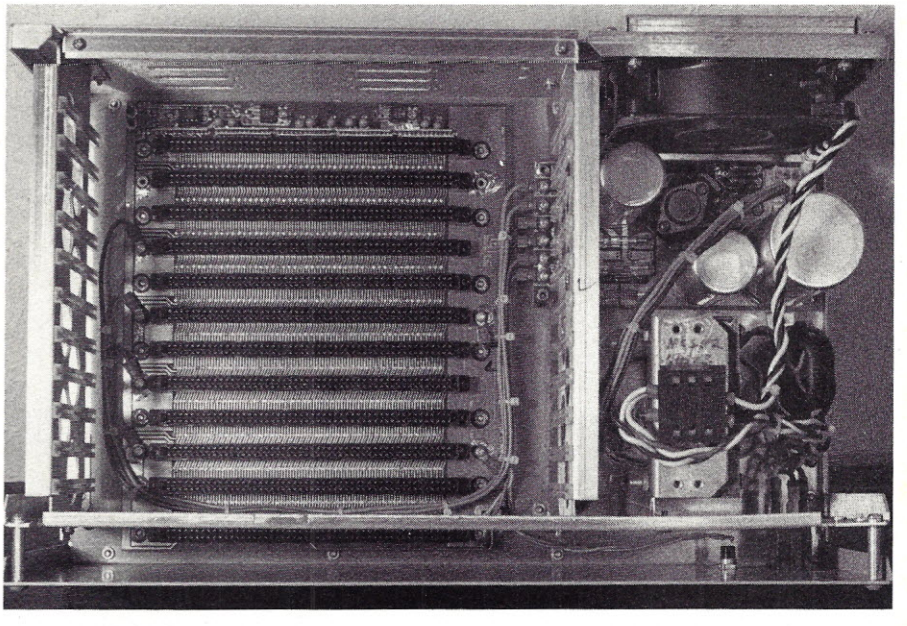
With the Heathkit H19 terminal on the left, the Diablo 1620 printer in the center and the TEI MCS-112 mainframe on the right, the installation is neat, compact and powerful. Dual Shugart SA800-1 disk drives are on the shelf underneath the mainframe and printer. Not shown is the Sunny International model R3 power supply on the shelf next to the drives. A cabinet and power supply for the drives would have cost about $200. Instead, I mounted the whole thing on a plywood sheet on one shelf of a stereo cabinet. The complete system is controlled by one power switch located under the near end of the bottom shelf.

on the S-100 bus.

The CPU board uses the Texas Instruments TMS9900 microprocessor and operates under a system disk executive with 64K RAM and dual eight-inch floppies. It is expandable to run under a multiuser, multitask operating system, with I/O peripherals and disk storage limited only by cost.

By building almost all of the system from kits, I saved about $1000 over what the units would have cost off the shelf. And, through a stroke of luck, I saved about another $1000 on the dual eight-inch floppy disk drives and power supply, plus several hundred dollars more on a high-quality daisy wheel printer.

This system was built from scratch,



Top view of the TEI mainframe shows the clean, rugged design. The well-filtered, regulated power supply is to the right of the divider panel. The large wires connect to the constant voltage transformer at front and cooling fan in rear. Power on-off and reset are the only front panel controls. The unit is compatible with the proposed IEEE S-100 standard.

but if you already have an eight-bit S-100 system, you can upgrade to 16 bits just by replacing two of your present boards. And you can keep the same memory boards and peripherals that you're using now. Although this system has 64K of dynamic RAM, organized as 32K of 16-bit words, the 9900 CPU board is designed to work with either eight-bit or 16-bit memory boards, or a mix of both.

Even if you're not using an S-100 system, you still may be able to use your same video terminal, disk drives and printer.

The System

The system is made up of three groups of equipment, plus system software. The CPU group comprises the CPU, PROM/RAM/SIO and memory boards, plus the S-100 mainframe/motherboard. Heathkit's model H19 terminal, the Diablo 1620 printer and the SSM I04 I/O board make up the I/O group, while two Shugart 800-1 drives, a Tarbell 1011 disk controller and Sunny International Power Supply R3 make up the disk drive group.

If you already have any or all of these units in a working system, just skim that part and move on. If you already have an S-100 computer system up and running, then you may be interested in how to upgrade to the M9900 16-bit system.

The Marinchip Concept

Several years ago the folks at Marinchip Systems (16 St. Jude Rd., Mill Valley, CA 94941) set out to design a 16-bit computer system to run on the S-100 bus, a bus that was designed largely for the Intel 8080 eight-bit microprocessor. The S-100 bus was not intended to be a bus standard. It was just the first—and for a long time, the only—bus around.

Marinchip Systems found that to design a 16-bit system that is compatible with the S-100 bus, they had to make the 16-bit system simulate some of the signals produced by the 8080. And this had to be done without sacrificing any of the power or performance of the 16-bit CPU.

One interesting problem, for example, was how to make the system mostly independent of the organization of the memory boards. If I already have an eight-bit system on the S-100 bus that works fine, do I really want to throw away $1000 that I have invested in 64K of memory boards

that are organized in eight-bit words? The designers at Marinchip considered this and other questions of compatibility.

The Marinchip 9900 CPU doesn't care whether the memory area is populated with eight-bit memory boards, 16-bit boards or a mixture of the two.

During a memory access, the SXTN-signal (pin 60) lets the CPU know whether the memory board is eight- or 16-bit. If the addressed memory board pulls this line low, the CPU knows that it is a 16-bit board.

And, as they point out in the M9900 manual, since this signal originates with the memory board itself, it is possible to mix the two kinds of boards.

As evidence of their success, the system operates just fine with the Tarbell Model 1011 disk controller, which was designed originally to operate in S-100 systems being driven by 8080 or Z-80 microprocessors.

This makes it nice for the paying customer. If I have trouble with my system, I can take any part of it to a local shop, where they can swap around components in other S-100 systems and quickly find the trouble.

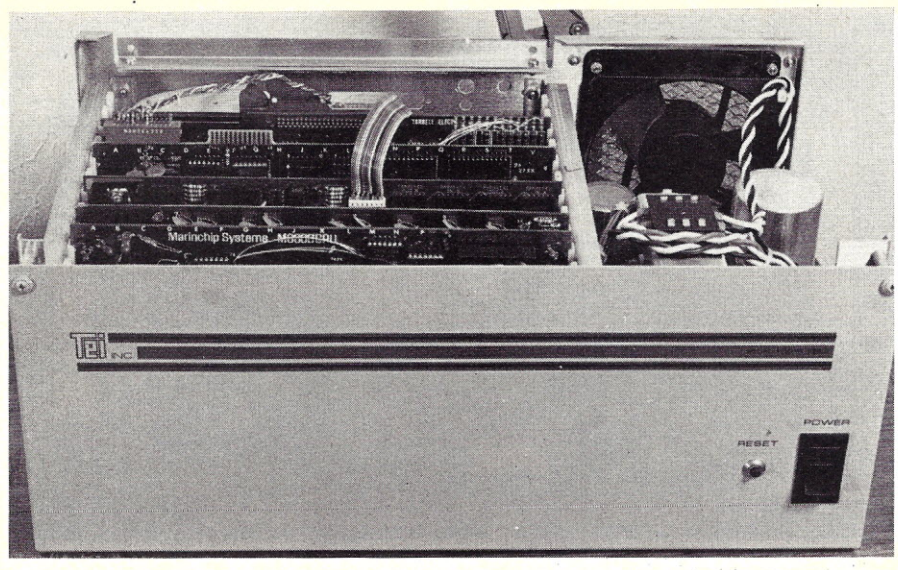
The CPU group is made up of the S-100 mainframe/motherboard and three printed circuit boards by Marinchip Systems. The 12-slot mainframe is by TEI, Inc., Houston, TX. The M9900 CPU board, the PROM/RAM/SIO board and 64K dynamic RAM board are by Marinchip Systems.

TEI Model MCS-112

One of my main criteria was a high-quality rugged mainframe with a heavy-duty power supply. The TEI model MCS-112 fills the bill.

The model MCS-112 features a completely assembled and tested 12-slot motherboard in a sturdy industrial-quality chassis and enclosure. The back panel is punched for eight DB25 and two DB37 connectors. The DB25s can be used for RS-232 connectors and the two DB37s for ribbon cables and clamps, such as the ribbon connector for the Tarbell disk controller. The front panel has a lighted power switch and a push-button reset switch.

The MCS-112 power supply has a constant voltage transformer. The supply is rated at 8 V @17 amperes, plus and minus 16 V @2 amps, over an input voltage range of 95 to 130 V ac.



Just behind the front panel of the TEI S-100 mainframe is the Marinchip Systems M9900 CPU board, with the 64K dynamic RAM next. The right-hand ribbon connector exits from the SSM IO4 board. Just behind the SSM IO4 board is the Marinchip PROM/RAM/SIO board, with a 32-pin edge connector on J2 providing interface with the system terminal. At the very rear is the Tarbell disk controller with its large ribbon cable exiting at a slot on the left of the rear panel. The right-hand section of the mainframe contains the heavy-duty power supply, constant voltage transformer and cooling fan.

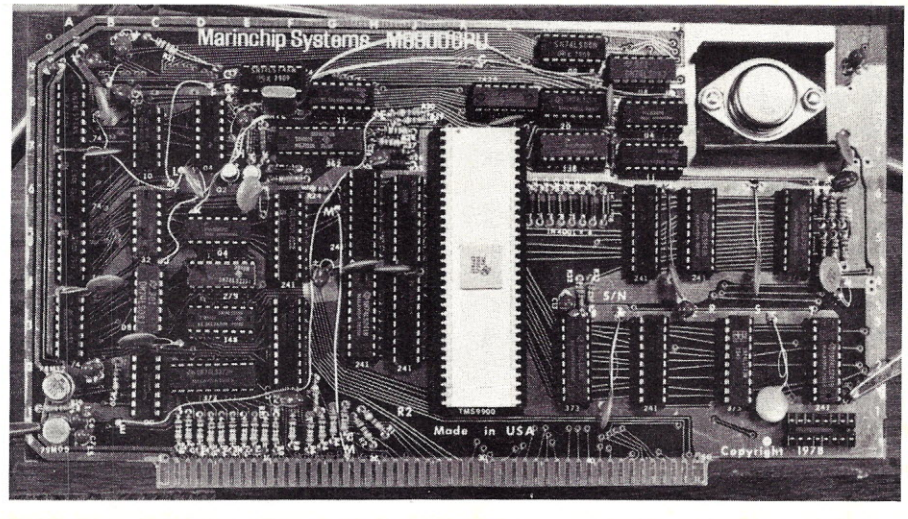
A built-in blower motor provides forced-air cooling. The blower motor is a possible source of complaint. It is noisy, although no noisier than any other fan/blower motor on equipment of this size. If the noise of a blower motor bothers you, then you should consider either locating the mainframe out of hearing or possibly choosing another mainframe. As for myself, I prefer the noise to the problems frequently encountered from poorly cooled equipment.

The model MCS-112 comes with a no-frills, but adequate, 14-page manual. The manual includes a schematic, parts layout drawings, a parts list, a brief theory description and instructions for test and checkout. The unit is described as being compatible with the proposed IEEE S-100 bus standard.

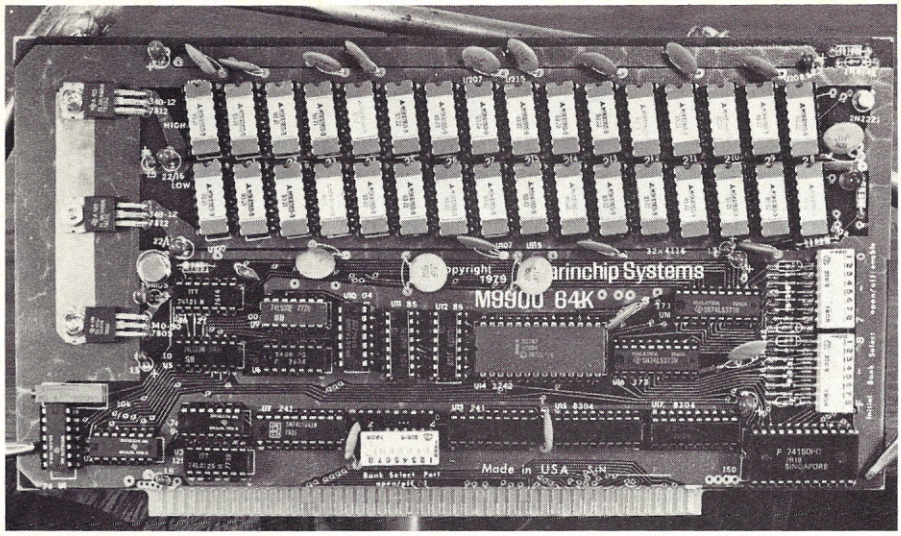
Marinchip Systems M-9900 CPU

When Marinchip Systems designed the 9900 CPU board, they produced a high-quality product and made it available either in kit form or assembled and tested. I bought the kit.

The board has plated-through



The Marinchip Systems M9900 CPU board shows the relative size of standard 7400 series TTL devices and the monster 64-pin TMS9900 microprocessor. The board comes either as a kit or fully assembled and tested. Kit construction is facilitated by the silk-screened board and clear, easy to follow instructions. For hardware types, Marinchip Systems also provides a comprehensive theory section explaining how they were able to make a 16-bit computer work on a bus designed for eight-bit systems.



The 64K dynamic RAM board features a clean, elegant design with 32 4116 dynamic RAM chips, controller and bank select/address decode DIP switches. The memory is organized as 32K of 16-bit words and operates from two to three times faster than comparable eight-bit boards.

holes, coating to minimize the possibility of solder bridge during construction and a grid layout to help in correctly locating the parts on the component side of the board. In addition, each IC socket location is silk-screened to show the type of IC chip that goes in the socket.

Instructions for building the board are good. Documentation for the 9900 CPU board includes 20 pages of step-by-step assembly instructions, a 12-page section describing theory of operation and an eight-page compatibility bulletin describing a number of system components manufactured by various companies. The bulletin gives information on how well the components work with the Marinchip 9900 CPU, and vice versa. It is a useful guide when selecting system components.

Construction is straightforward, with only a few jumper connections required at the end of construction. Instructions for placing the jumpers are concise and easy to follow.

If you have experience in placing ICs in their sockets, you will probably have no trouble installing the 64-pin 9900 microprocessor. Otherwise, carefully follow the direction provided by Marinchip Systems and you should be OK.

All sockets are provided for the 36 ICs, including the one for the 9900 CPU. In addition to the ICs, the other parts include three on-board three-pin voltage regulators, 39 resistors, 33 capacitors, one inductor and one crystal, plus all the small hardware necessary for mounting the regulators.

I'm a careful, methodical worker, and it took me about eight hours to build and check out the board, following the tests outlined in Marinchip's instructions.

Though I work under a magnifying lamp, I still failed to solder one of the IC socket pins. The board passed all of the voltage and waveform tests but still failed some of the final tests. It is extremely difficult to troubleshoot a system when every item in it is new and built mostly from kits. After trying to find the trouble myself, I sent the board to Marinchip Systems. They gave me one-day turnaround, sending it back by UPS. It has been a long time since anyone gave me that kind of service at any price, especially after the sale.

Marinchip Systems PROM/RAM/SIO Board

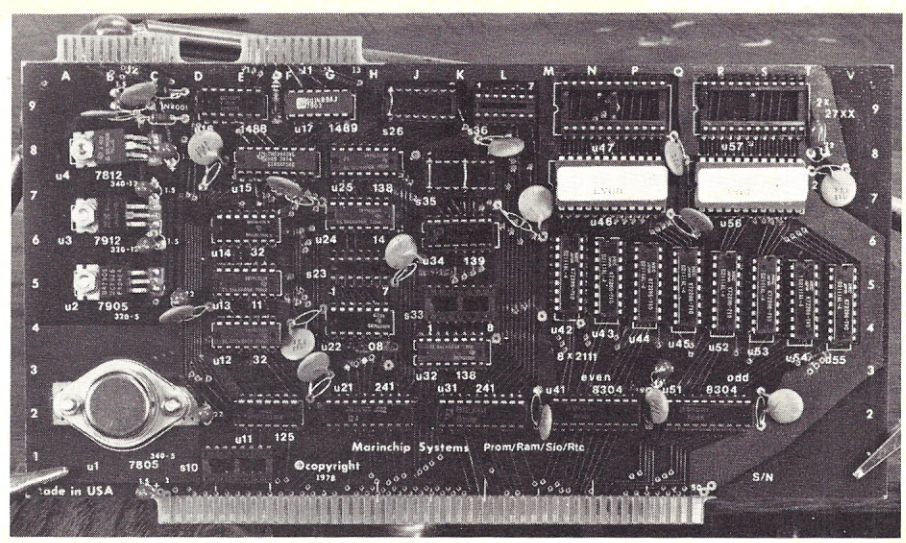
Typical of Marinchip quality, the PROM/RAM/SIO board provides all of the functions of a serial I/O, 2K PROM-based system monitor, 1K of scratchpad RAM and real-time clock, all on one coated board with plated-through holes and silk-screened layout. In addition to the system monitor PROM, the board provides for up to 8K of user PROM storage.

Documentation for the PROM/RAM/SIO board is thorough, with 16 pages of step-by-step construction notes, plus a 22-page booklet covering theory of operation and system configuration. Included in the guide are 11 pages of waveforms and schematics.

Also included are the instructions for determining what kind of jumper options you need with your particular system configuration, plus the instructions.

One of the unique characteristics of the Texas Instruments 9900 microprocessor is its communications register unit. The CRU makes it possible to address any bit out of a 4K bit address space at any time. Thus, you can input or output serially from one to 16 bits at a time.

The addressing and decoding techniques used in CRU input/output are different than those used in memory-mapped I/O. But there are distinct advantages, such as the size of the spe-



The PROM/RAM/SIO board provides serial I/O between the CPU and the terminal, plus a ROM-based debug monitor, real-time clock and scratch pad RAM. A version is also available to be used strictly as an I/O port. The two 32-pin edge connector ports at upper left are for I/O. The one on the left, J2, is for interfacing with the terminal. Only one of the connectors can be used at a time. The one on the right, J1, is for modem hook-up.

MORE GOOD NEWS FROM MARINCHIP SYSTEMS

OFF-THE-SHELF 16-BIT HARDWARE AND SOFTWARE

16-BIT HARDWARE

Why wait when you want a state of the art 16-bit microcomputer? At Marinchip Systems, we believe in being responsive to your needs. So when you want a system that delivers, call Marinchip Systems, because we have it in stock.

* S-100 CPU board
* TMS9900 microprocessor from Texas Instruments
* Support for 8-bit and 16-bit memories and peripherals
* Software included with CPU
* CPU price - $700.
* 64K byte memory with 16-bit access, bank-select for multi-user systems - $1050.
* Quad SIO board with four programmable asynchronous or sychronous ports - $350.
* Complete systems (except CRT) with 1 Megabyte floppy disc storage - $5500.
* Hard disc available.

CBASIC is a trademark of Compiler Systems

16-BIT SOFTWARE

Because we're a total computer company, we also carry our series of the most complete and flexible software systems available anywhere. So when you want the software that delivers, call Marinchip Systems, because we have it in stock.

* Single-user Disc Executive - free with CPU
* BASIC interpreter, relocatable assembler and linker, debug monitor, utilities - free with CPU
* EDIT: Context editor with the same features found on UNIVAC, CDC, DEC systems - free with CPU
* WORD: Document formatter with justification, page numbers, user-specified headings and footings, macro expansion, copy from disc, and more - free with CPU
* WINDOW: Simplest, most powerful screen editor you can buy - $250.
* Extended Commercial BASIC: interpreter with 16-digit precision, Print Using, random access disc files - $120.
* PASCAL: Brinch Hansen's Sequential Pascal - $150.
* Applications: The Osborne General Ledger, Accounts Payable/Receivable, Payroll, full source in QBASIC - $150. each
* NOS: Multi-user operating system with byte-addressable device-independent files, hierarchical file system, read/write/execute protection, print spooling, background batch, upward compatible from Disc Executive - $250.
* QBASIC: Extension of CBASIC 2 TM that generates fast machine code for the 9900. New and unique options include fast binary I/O, separate compilation of functions, assembly-language functions - $220.
* Documentation: CPU, free software package, PASCAL, NOS - $40 - applicable to purchase; QBASIC - $20; Applications - $25 each

Marinchip Systems ✓31

Computer Power and Human Reason
16 St. Jude Road
Mill Valley, CA 94941
415/383-1545

Advertising Design: Asterisk Associates

cial I/O chips used with CRU I/O. The TMS9902, for example, is much smaller than its counterpart in a memory-mapped I/O. If you compare the size of a 6850 ACIA, used in a Motorola 6800 system, you'll find that the 6850 is a 24-pin device, compared with the 18-pin DIP packaging of the 9902.

The 9900 microprocessor can be used in either or both types of I/O. In my system, I use the CRU I/O of the PROM/RAM/SIO board for the Heathkit H19 terminal, and I use memory-mapped I/O for the Diablo 1620 printer. Later, I will also be using memory-mapped I/O for modem communications.

64K Dynamic RAM Board

Marinchip Systems took an array of 32 type 4116 dynamic RAM chips and came up with a 64K dynamic RAM board organized as 32K of 16-bit words. They use a bank-select memory scheme to implement its multiuser networking operating system. The 64K dynamic RAM board is designed to support the bank-select feature. Since the board is designed for 16-bit transfers, it operates about three times faster than a comparable eight-bit board. But this 16-bit transfer feature also means that this board cannot be used in another system operating with eight-bit data transfers.

Marinchip also states that this board is not compatible with DMA data transfers. Devices using DMA data transfers to and from eight-bit memory boards in the system have no interaction with the Marinchip 64K dynamic RAM board. But the board cannot handle DMA transfers to and from itself. The board comes assembled and tested, with full instructions for setting the DIP switches for memory-map assignment.

Disk Drive Group

The disk drive subsystem consists of two Shugart SA800-1 floppy disk drives, a Tarbell Model 1011 floppy disk controller and a Sunny International Power Supply, Model R3.

Current Marinchip Systems software supports single density operation only, although a double density software system is nearing completion. For single density operation, the Tarbell model 1011 controller is a good compromise between cost and quality. The disk subsystem produces soft-sectored disks that are compatible with the IBM 3740 format for single density recording. This means that there are 77 tracks, numbered 0 to 76, with 26 sectors on each track, numbered 1 to 26. Each sector contains 128 bytes of information. This gives a total storage capacity of about 256K bytes per disk, if you're using single-sided disks.

Shugart's Floppy Disk Drives

If you are lucky enough to find a couple of the Shugart Model SA800-1 floppy disk drives, you will be pleasantly surprised to find that they are low in cost and high in performance. Note that this is the model SA800-1 and not the model 801. You probably won't find the model SA800-1 new. This version of the model SA800 was OEM-built by Shugart for a large company to be used in word-processing systems. There seems to be quite a few of them around on the used equipment market. I was fortunate enough to find two for less than $500, including the drive electronics, but without either a case or power supply.

The documentation with the drives included an instruction manual, complete with theory of operation, waveform diagrams, adjustment procedures and schematic diagrams. All of this information is for the Model SA800/801. The manual clearly shows the major differences between a standard SA800 and the 801. But the only information concerning the model SA800-1 is a statement that the 800-1 contains its own data separator. The schematics make no references to the model 800-1.

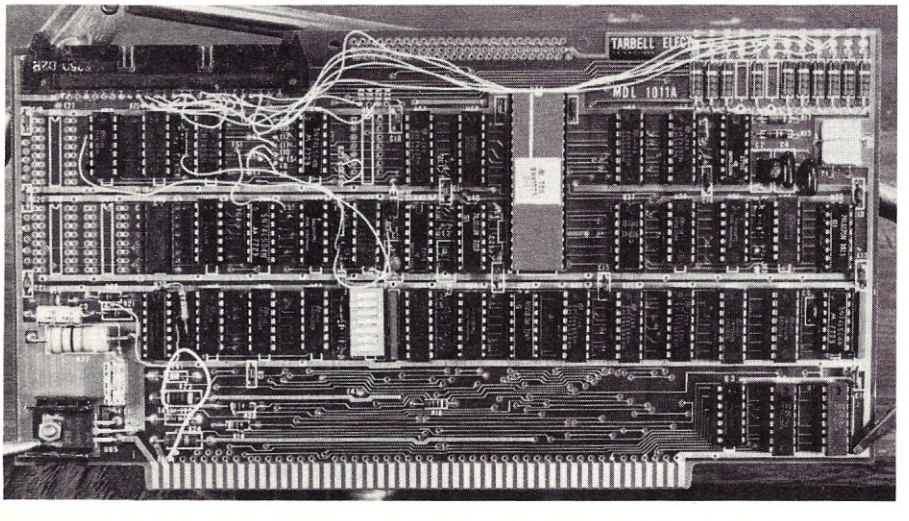
I tried to get the drives to work and achieved some success. But operation was erratic. Sometimes everything would work fine; at other times, it would bomb.

I visited the local Shugart sales office, where the sales engineer gave me a set of the correct schematics and the parts layout drawing and parts list.

I made all the strapping arrangements exactly as shown on the new schematic, and most of the problems seemed to disappear. One trouble persisted, however. Although the drives seemed to work fine in all other respects, I could not always copy a full disk from one drive to the other. When they did work, they seemed a little slow.

I took it to a technician, who added a lot of jumpers to the drive electronics. He said that, in effect, he had converted the drives to 801s. So, the drives do everything they're supposed to do, and they do it faster and quieter than they ever did before. And here's the final payoff: total cost for the repair work was $60.

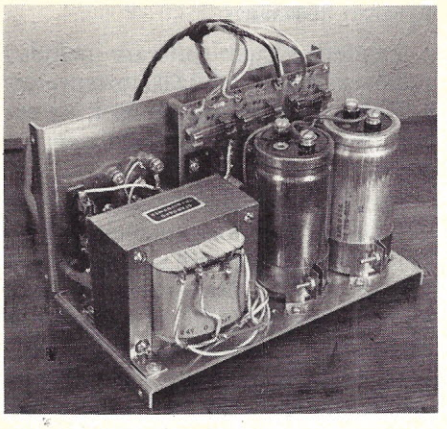
Incidentally, I asked the Shugart sales engineer whether the 800-1 drive could be used in double density systems. He said that the 800-1 should work fine in double density systems without any problems at all.



The Tarbell model 1011 disk controller can be used with a large number of different disk drives, both eight-inch and minifloppy. I/O to the drives is by the ribbon connector plug at the upper left. The DIP switch at lower center is set for use in the M9900 system, with all switches off. This board has an on-board bootstrap ROM, which is not usable in the Marinchip M9900 system, since the ROM contents are in 8080 machine language. It is useful on the troubleshooting bench, though, when servicing the drives.

Tarbell 1011 Disk Controller Board

The Marinchip M9900 system was designed to operate with standard



Model R3 dual drive power supply by Sunny International provides all dc voltages necessary for the two eight-inch drives. You have to provide your own interconnecting harness and connectors and use care when soldering to the power supply terminals. But at about $65, plus shipping, it is still one of the best buys that you'll find advertised in Kilobaud Microcomputing.

S-100 peripherals. As an example, the Tarbell model 1011 disk controller board has been around long enough that it is one of the "tried and true" industry standards.

If you're new to the S-100 bus (as I am) and ask a few questions of people who've been using it for a while, you'll get a lot of good comments about the Tarbell controller.

The Marinchip compatibility bulletin lists it as one of the preferred controllers for the M9900 system. A couple of others are recommended, but the Tarbell controller seems to be the best overall compromise between quality and cost. And if you do use the Tarbell controller, you won't be forced to use any one particular kind of disk drive.

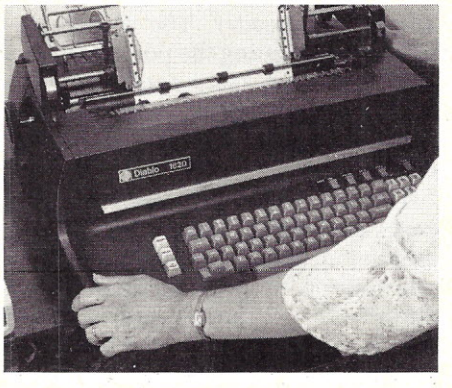
You can buy it either as a kit or assembled and tested. Kit construction is straightforward, with no hidden traps. The built-in strapping options make it useful with a wide variety of disk drives. Strapping information is given for most of the more popular disk drives, both eight-inch and mini.

If you use the Tarbell controller with the Shugart eight-inch floppies, follow the strapping information in the Tarbell manual for the SA800/801. A question does arise concerning jumpers 146, 147 and 148. In my system 146 is jumpered to 148.

Sunny International Floppy Disk Power Supply

Adequate dc power for the SA800-1 disk drives is provided by the model R3 power supply by Sunny International. Voltages of +5 V @8 A, −5 V @1 A, and +24 V @5 A are provided in an open-frame construction with good fuse protection and adequate heat sinking. The three dc supplies use three-terminal regulators, with outboard series-pass transistors used in the +5 V and +24 V supplies. As shipped, the power supply has a two-wire ac line cord, which I replaced with a three-wire cord. I connected the third (green) wire to the chassis.

You have to build your own connecting harness to interface the power supply with the disk drives. They recommend 14-gauge wire between the power supply and drives, and 12-gauge for common ground connection. The drives require a mating connector, AMP part number 1-480270-0, with AMP pins, part number 60619-1, or equivalent. The connector for ac power to the drive motors is AMP P/N 1-480305-0, with AMP pins P/N 60620-1, or equivalent. If all else fails and you can't get the connectors locally, try KA Electronic Sales in Dallas. They were able to get the connectors for me.



The Diablo 1620 printer-I/O terminal has a numeric keypad, tractor feed mechanism and print speeds from ten to 45 characters per second. Speeds are switch-selectable from a front panel mounted just under the pop-off nameplate. The top right row of keys are for reset, form feed, set top of form, scroll and power on-off. The tractor feed mechanism pops off in seconds.

The power supply is built on a printed circuit board, which is mounted to an aluminum chassis with standoffs. Connection to the circuit board is provided by terminals, which are soldered to the foil on the bottom of the board.

The power supply is built on a printed circuit board, which is mounted to an aluminum chassis with standoffs. Connection to the circuit board is provided by terminals, which are soldered to the foil on the bottom of the board.

A problem arises in connecting such large wire to the pins. Sufficient heat to make a good electrical connection is also enough to melt the solder that connects the pin to the foil. Use care that this doesn't happen. It would help if larger connector pins were provided.

Heath H19

I found the Heath Model H19 to be pretty much as reviewed in *Kilobaud Microcomputing* ("Heath's H19: A Detailed Look at a Super Terminal," February 1980, p. 58). Construction took me about 27 hours, not counting debugging. I did make a common construction mistake that cost some time during final checkout. I inadvertently interchanged the two large TO-3 power transistors located in the power supply. So, when I gave it the smoke test, it passed, giving lots of smoke. Two transistors, one potentiometer and a couple of diodes later, everything was fine, and has been since.

Diablo Daisy Wheel Printer

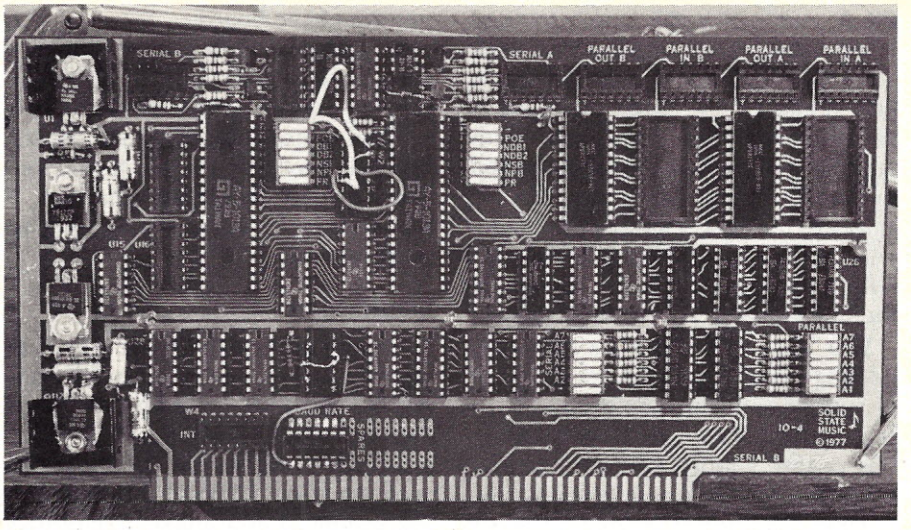
With print speeds from 10 cps to 45 cps at baud rates of 110 to 1200 baud, the microprocessor-controlled model 1620 HyType II printer is probably one of the finest printers on the market. It is actually an I/O terminal as well as a printer. And a wide variety of type styles adds to its versatility.

Except for 1200 baud, the baud rates are switch selectable. For 1200 baud operation, a jumper is required on one of the circuit boards. When the 1200 baud jumper is in place, the speed switch has no effect.

The model 1620 will operate at baud rates to 300 baud with no handshaking required. For 1200 baud, however, you'll need an ENQ/ACK protocol in the software driver.

The HyType II printer mechanism is used in a wide variety of printer mechanisms; the model 1620 is only one of a large line. Some versions use metallized print wheels. Mine uses the plastic wheels. Some users think that the metallized print wheels give better printing quality. If you decide to buy one of these beauties, you should know three things.

First, if you want the metallized print wheel, you must specify before you buy. Printers designed for the plastic print wheels won't work with the metal ones. Second, repairs were quite expensive. Although I have had nearly a year of good service under



SSM Model IO4 I/O board provides two serial and two parallel I/O ports. The two DIP switches at lower right do the address decoding for the serial (left) and parallel (right) ports, respectively. The upper two DIP switches set the mode parameters for the two serial ports. Above and to the right of the top right mode switch is a 16-pin IC socket which accommodates a 16-pin header to a ribbon cable for I/O to the printer.

heavy-duty conditions, I did have a servo board fail. Third, I have seen the model 1620 advertised for over $3000 new, but you might be able to find one for less than $2500 used.

Documentation for the Model 1620 includes a fine operator's manual and, for $20, a superb maintenance manual. The maintenance manual contains complete schematic and logic diagrams, the theory of operation and a parts list. It is well worth the price.

SSM Model 104 2P + 2S I/O Board

The SSM Model 104 I/O board is a high-quality kit that provides two serial and two parallel I/O ports for S-100 microcomputer systems. The kit uses a coated board with plated-through holes. The coating minimizes the possibility of solder bridges during construction, and the plated-through holes ensure that the etch makes good contact on both sides.

Assembly instructions are good. SSM provides information for configuring the board for a variety of systems. They also give information on a hardware interface with the Heathkit H14 printer's busy signal.

The Heathkit manual gives instructions for modifying the printer to produce the complement of the busy signal. If you have made this modification, then you will need to modify the circuit shown in the SSM manual. All you have to do is leave the NAND gate being used as an inverter immediately following the zener diode added during the SSM modification.

A number of strapping options must be implemented to make the SSM board work in the 9900 system. Some of them involve dual inline (DIP) switches; one involves soldering a wire on three of the pins of a 16-pin DIP header. The switch settings are for setting the port addresses and the baud rate, parity, and so forth, on the serial interface. Set these according to your system configuration.

The baud rate between the computer and printer must agree. So, decide what baud rate you're going to use with your printer. Then run a strap from W2 pins 11 and 12 to the pin that corresponds to the baud rate you're using. For example, if you're using 300 baud, use pin 4. But for 1200 baud, use pin 2. And for 4800 baud, use pin 6.

Using the SSM Board with the Diablo 1620 Printer

If you're using the SSM board with the Diablo model 1620 printer, you can run the printer at 300 baud without handshaking of any kind, either hardware or software. But if you run the printer at 1200 baud, you will have to strap it inside for 1200 baud rate. And you will have to provide a software handshake in your printer I/O routine. I am running mine at 300 baud until I get the time to write the handshaking routines.

Without handshaking, the printer occasionally loses a character. I ran it for nearly a year on another system at 1200 baud with handshaking; it hardly ever lost a character. So, the handshaking is important.

System Software

Standard system software includes a disk executive, a BASIC interpreter, a ROM-based debug monitor, an excellent text editor and a good text processor.

The BASIC is similar to Microsoft 12K BASIC, but does not include double precision, random access files or PRINT USING. However, an extended commercial BASIC is available at extra cost; it has all these features, plus 16-digit accuracy and CHAIN with common variables. It also lets you save either the source or compiled code. Both types of BASIC include long variable names, integer arithmetic, sequential files and the full complement of string and mathematical functions.

The executive supports named files on disk, contains all I/O drivers and handles peripherals the same as any other files. The executive allocates system memory to programs automatically, so that programs can automatically adapt to the amount of free memory.

Other built-in features include an editor for editing from the local terminal, an assembler and a linker. All system calls are compatible with the Marinchip Network Operating System, so that any programs developed to run under the disk executive will also run under the NOS if you later add it to the system.

If the system encounters an unknown command, it searches the user files for a program by that name. If one exists, it loads and executes it. This lets you customize your system without having to modify the executive itself.

I like the set of disk executive troubleshooting routines called Brainstorm. They are helpful in troubleshooting system memory and the main processor board.

Other built-in features of the executive include a routine for programming EPROMs on the Cromemco Bytesaver PROM Programmer, plus other disk-handling functions, such as disk copy, name, rename, initialize disk and file diagnostics.

One feature, which is really part of the Debug monitor, but runs under direction of the system executive, is the T utility for emulating a terminal when communicating with other systems.

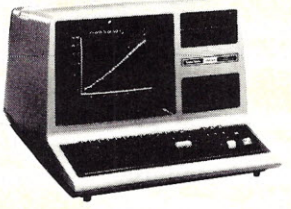
I would like to see one other feature incorporated into future versions of the executive—the ability to

AUTHORIZED TRS 80® DEALER #R491

$670.00 **MODEL I**
16K Level II with Keypad
26 – 1056

$3500.00 **MODEL II**
MODEL II, 64K
26 – 4002

$875.00 **MODEL III**
MODEL III 16K RAM,
MODEL III BASIC
26 – 1062



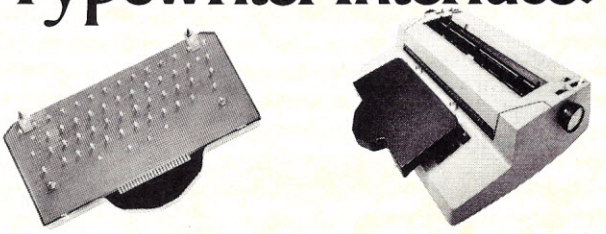
WE ACCEPT CHECK, MONEY ORDER, OR PHONE ORDERS WITH VISA OR MASTER CHARGE. SHIPPING COSTS WILL BE ADDED TO CHARGE ORDERS. DISK DRIVES, PRINTERS, PERIPHERALS, AND SOFTWARE – YOU NAME, WE'VE GOT IT. WRITE OR CALL FOR OUR COMPLETE PRICE LIST.

FULL FACTORY WARRANTY ON ALL ITEMS SOLD.

C & S ELECTRONICS, LTD. 32 EAST MAIN ST. MILAN, MICH. 48160
✓79 (313) 439-1508 (313) 439-1400

C & S ELECTRONICS MART IS AN AUTHORIZED TRS 80® SALES CENTER STORE #R491

At last...the Typewriter Interface!



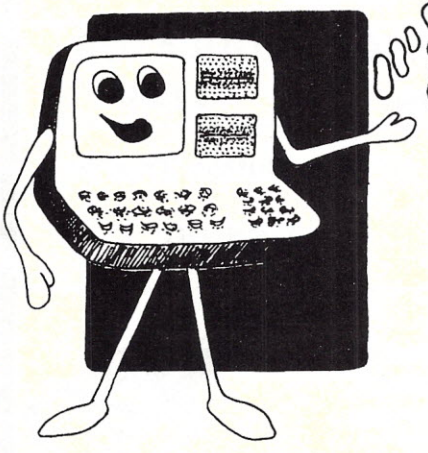
Turn your electric typewriter into a low cost, high quality hard copy printer. 1 Year Warranty

Dynatyper—the patented* RDI–I/O Pak is fast becoming the industry standard for typewriter output. Why? Because:

1. It takes 2 minutes to initially install and 5 seconds to remove or replace.
2. You *do not* have to modify your typewriter. All factory warranties and maintenance agreements on your typewriter will be honored.
3. You can use it with *all* powered carriage return typewriters that have U.S. keyboard. Our Model I works with all *non* Selectrics and our Model II works with Selectrics. Conversion between models takes 2 minutes and the kit (26 plungers) is available for a nominal charge.
4. You don't have to lug around a bulky printer when you travel. If there is a typewriter at your destination, you can install the light (3 lbs.) I/O Pak in just 2 minutes.
5. Same interface for TRS-80, Apple and GPIB. Centronics and Pet compatible interfaces are available in third quarter 1980. Electric pencil available.
6. Delivery: Stock to two weeks. Price: $499. for the complete system, FOB Rochester, Domestic.

Over 1000 in operation today. VISA and MasterCard accepted. Call Ken Yanicky at 716-385-4336.

*Patent Pending ✓201 **ROCHESTER DATA**
3100 Monroe Avenue, Rochester, New York 14618 incorporated



LOOK MA!! I HAVE DRIVES!!

TRS-80* Model III now available
with full range of M.P.I.
Double Density Drives
up to 2.8 Meg'bytes on-line
floppy disk storage.

Also available - Ultra DOS

CALL FOR OUR UNBELIEVABLE LOW PRICING

LEVEL IV PRODUCTS, INC. ✓23

32238 Schoolcraft Road, Suite F4 • Livonia, MI 48154
313-525-6200 Outside Michigan call 1-800-521-3305

Please add $2.50 for shipping and handling. $1.50 C.O.D.

**Product of the Tandy Corporation*

Level IV Products Catalog
NEW - SEND $2 FOR YOUR COPY
REFUNDABLE ON FIRST ORDER

Dealers Orders Welcome

master charge VISA

type ahead. I hate waiting for one command to be executed before I can type in the next one. I would like to see this feature linked with the editor, too.

Text editing is easy using the Marinchip text editor. It is a line-oriented context editor with two modes, input and edit. This makes it easy to create new files or to edit and modify existing ones.

For example, making changes within a line is easy. Eleven commands are available under the general command ALTER just for making changes within a line. When in the edit mode, any of these commands can be used at any time within a line. This makes the editor flexible for within-the-line changes. Other commands are available for general editing and formatting.

One unique feature of the editor is its automatic paging to disk files when the size of a file approaches being too large for available memory. This paging to the editor-backing files is automatic, without any user intervention.

I'd like to see one feature added to the editor. The editor has provision for line numbers, and I'd like to be able to toggle the line numbers on or off. As it is, if you want a line displayed with its number, you must command it each time.

I would also like the ability to read in a specified number of lines from a disk file. As it is, if you want to read any part of a file from disk, you must read in the entire file. When editing large files, it helps to be able to read in 100 or 200 lines, edit and spool it out to a new file, repeating this process until the entire file is done. This is valuable when a file has 1500 or 2000 lines of text.

Even without these features, though, I like the Marinchip text editor.

The Marinchip Systems text processor has a number of features that make it a powerful, flexible and useful tool in writing. The surprising thing is that it comes as standard Marinchip software, and not as an option.

The text processor makes it possible to automatically format text, set up footers and headers, set up justified right and left margins and assign page numbers. It has a decimal-numbering mode for paragraphs, so that it will automatically number the paragraphs and generate a table of contents for the document. It can produce multiple-column output so that text can be printed in two or more columns.

Macro capability makes it possible to predefine text—or even entire documents—to be called up as part of the document being processed. During form letter generation, for example, text from more than one file can be automatically called up and included in the text of the letter.

The processor commands are embedded in the text during editing and then acted upon during processing.

The Marinchip text processor probably does just about anything that you'd need in a text processor for general business correspondence.

Room for Improvement

I'd like to see a few enhancements added to the text processor. First, I would like to be able to relate the position of the page number to the page number itself. That is, I would like to be able to set the processor so that on even-numbered pages the page num-

60 Hz CRYSTAL TIME BASE
$4.95 (Complete Kit)
Uses MM5369 CMOS divider IC with high accuracy 3.579545 MHZ Crystal. Use with all MOS Clock Chips or Modules. Draws only 1.5 MA. All parts, data and PC Board included. 100 Hz, same as above, except $5.95

D.C. HORN
VERY LOUD!
6-12 VDC
Like Used In Smoke Alarms.
FANTASTIC SAVINGS.
Compare this true value.
.60 ea. 4 For $2.00

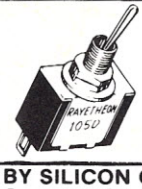
PMD-11K-60
60 Volts. HFE 800-20K
12 Amps. PNP TO-3
150 Watts. By Lambda.
$1.50
BRAND NEW!

D to A CONVERTER
MC1408L6 Each
While They Last **$4.95**

4K By 1 STATIC MEMORY
MK4104-4 $4.50 Ea.

MICROWAVE DIODE
For Down Converters
5082 - 2835 **$1.50 or 5 For $6.00**

MICRO MINI TOGGLE SWITCHES
6 for $5 with hardware.



99¢ EACH

SG3501A VOLTAGE REGULATOR BY SILICON GENERAL
14 Pin Dip. ± 15V Regulator - Great for OP AMP Supplies — Output Adjustable For ± 10V to ± 23V — Thermal Shutdown Protected.
★ $.75 Each or 3/$2.00 ★

SEND FOR FREE FALL CATALOG

Digital Research: Parts
(OF TEXAS)
P.O. BOX 401247C GARLAND, TEXAS 75040 • (214) 271-2461

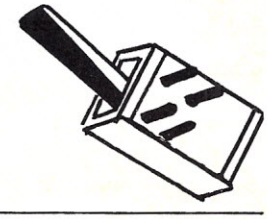
Push Button Switch - Normally Closed
6/$1.25

7806 VOLTAGE REGULATOR
6 Volt 1 Amp $1.20



10 Ohm Button Trim Pot
4/$1.00

SWITCH
Same type as used on some computer boards.
$.69 Each DPST or can be arranged SPDT.
5 For $2.50



OPCOA CLOCK #R1200 AC
12 Hour Format. 12 Volt Operation. .3 Inch Display. Has Radio (Alarm) Output. Complete with On-Board Switches and 4 Pin connection for easy hook up. With Data.
Add 60Hz Time Base for DC Operation.
SUPER SPECIAL 2/8.00 or $4.28 each
Plug in transformer and all parts to make clock operational $2.20.

TERMS: Add 50¢ postage, we pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa, MasterCharge and American Express cards. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P&H. 90 Day Money Back Guarantee on all items.

The Marinchip text processor probably does just about anything that you'd need in a text processor for general business correspondence.

ber appears on the left side of the page and on odd pages appears on the right side. Also, I'd like to be able to set up some test for the execution of conditional macros and set traps for the execution of macros or other processor commands. And I'd like access to some number registers that I could define as needed for setting up my own formatting profiles. Finally, I'd like the ability to have the processor output selected pages of processed text.

For example, if I have a 15-page file and have just revised pages 12 through 15, I'd like to run the file through the processor and output only those pages. As it now stands, I have to output the entire file just to see how the last four pages look.

Another problem is a glitch that occurs on page boundaries during processing. For some reason, the printer hesitates and sometimes misses a character. I talked with Marinchip, and they were already aware of the problem. A revised copy of the editor/processor package solved the problem.

One of Marinchip's policies that I like concerns software cost. They want to keep it as painless as possible. So, as they revise their software, they make the revised versions available on eight-inch disks at $6.30 per disk. This barely covers the cost of the disk.

Extra-cost software for the system includes the extended commercial BASIC, the network operating system, a seven-pass Pascal compiler and a version of BASIC called QBASIC.

The network operating system, or NOS, makes it possible to have multiple terminals, multiple printers and other I/O devices, all seemingly operating at the same time. To use the NOS, you have to devote a 64K board of memory to the CPU and one additional 64K board for each terminal. You can have one terminal operating with the NOS with only one 64K board, but in that case the CPU gets 32K and the terminal is limited to only 32K for its use. The best arrangement is to reserve 64K for the CPU and 64K for each terminal in the system. In anticipation of small businesses using the system under NOS, Marinchip sells a 40 megabyte hard disk drive system and a 165 cps line printer.

Their QBASIC is described as being so close to CBASIC that software written to run under CBASIC can be run under QBASIC with only minor changes. They have implemented the Osborne general ledger, AR/AP and payroll packages under QBASIC.

For folks who may already have invested a bundle in software written in CBASIC running under CP/M, Marinchip has developed a disk utility to let you load CP/M-compatible ASCII files into the Marinchip M9900 system.

The seven-pass Pascal compiler is a sequential Pascal, with great differences between it and other Pascals. They intended their Pascal to be used more for software and applications development than for other purposes.

There is just one thing that I'd like to see added to the system software: a good driver that implements all of the bells and whistles on the Diablo model 1620 printer. This would include backspace/underscore, superscripts and subscripts, plus a number of routines for using the graphics capabilities of the printer.

Putting It All Together

Once all the units have been built, you can start putting it all together into a working system. Four things need to be checked: the interfaces between the CPU and terminal, the CPU and printer, the disk drive to CPU interface and the address switches in the 64K dynamic RAM board if you are using it.

On the PROM/RAM/SIO board, you will use the upper left 32-pin edge connector, J2, for interfacing the CPU with the terminal. There is a one-to-one correspondence between these pins and the pins on the DB25 terminal connector. I used pins 2, 3, 4, 5 and 7. At the DB25 connector, I shorted pins 6 and 8.

Setting the addresses for the 64K RAM board and the SSM I/O board will depend on the instructions you receive from Marinchip Systems. This, in turn, depends on your particular system configuration.

If you are using the Tarbell controller, you will set all sections of the DIP switch to off for normal running. During the final test, you will set section 6 on to prevent accidental erasure of your disks.

The Tarbell controller contains a ROM-based bootstrap program that was designed for 8080/Z-80 S-100 systems. Since it was written in 8080 machine language, you won't be able to use it in the 9900 system. It will pay off, however, if you need to have the disk drive subsystem repaired or adjusted.

You must debug your system after construction is complete. I allowed ten days for debugging this system. During this time, I had two solder bridges, three bad IC chips and one IC pin that was unsoldered, plus the goof with the Heath H19 terminal.

Since all of the kits were of such high quality, and because of the usual high reliability of IC components, I feel that I may have inadvertently damaged the chips myself. I worked during cold weather, when LSI chips are most susceptible to damage from static electricity.

In any event, if you have trouble and can't correct it yourself after a reasonable effort, then call Marinchip Systems. They will bend over backwards to help. And if you do send the boards to them, they can find the bad board in a matter of minutes and then find the trouble in another few minutes.

If you want to move up to 16-bit technology, if you want a business system that can handle two to four eight-inch floppy disk drives with expansion capabilities to over 40 megabytes of hard disk with multi-user capacity, then the Marinchip Systems M9900 could be the one for you. ■

A machine-language program that tightens up North Star BASIC programs.

Blank Removal

By Rinaldo F. Prisco

There are many reasons why you might want to remove spaces from a program. Such a procedure will conserve disk space and RAM, and increase execution speed.

In most cases, you won't gain much. Keeping the spaces will make programs more readable, and thus more easily maintained. But sometimes removing them might be advisable, or even necessary—you can write longer, faster programs with more variables in the same amount of space.

This 87-byte machine-language program will remove all unnecessary spaces occurring in a North Star BASIC program. It is in 8080/Z-80 code, and is thus much faster than similar programs written in BASIC. It is also easy to use; you simply enter the DOS, type GO REMOVE <CR> and you are done. The program even returns you to BASIC.

Program Design

The idea behind the program is simple. You use two pointers: the source pointer (DE register pair) and the target pointer (HL register pair). You examine each byte of the source code. If it is not the ASCII code for a space, it is written back to the target. The pointers start out even. As more spaces are removed, the HL pointer falls further behind the DE pointer.

You want to avoid removing spaces that occur in REM statements or between quotation marks so you check for them, jumping to the proper routine when they are encountered.

You also want to avoid removing "false" spaces. The ASCII code for a space is 32 (20H). This byte can occur in line numbers or in line numbers referenced by GOSUB- or GOTO-type statements. For example, "GOSUB 8200" will contain the byte 32 since 8200 = 32*256 + 8. You must recognize line numbers and their references to avoid being fooled.

Line numbers themselves are fairly straightforward since they always occupy the second and third bytes of a new line (the first byte contains the number of bytes in the line). New lines begin with the byte that follows a "true" ASCII CR, the byte 13 (0DH). Whenever a CR (not in a line number or reference) is encountered, you update the number of characters in the line being revised and begin scanning a new line.

Line numbers referenced by GOSUB- or GOTO-type statements are always prefaced by the byte 154 (9AH) and occupy the next two bytes (low byte, high byte).

Program Description

The program in Listing 1 is designed for the standard configuration of Release 4 North Star BASIC. It is easily modified for other versions. The only changes that might be required are in the address where the first program byte appears (5B93H in Release 4) and the address where BASIC is entered, preserving loaded programs (2A04H in Release 4).

The program was assembled at 0 but could be assembled to reside anywhere other than RAM occupied by the DOS, the BASIC interpreter or the BASIC program. It can even be assembled to reside in high BASIC RAM. If so, you need not modify the BASIC RAM with MEMSET, since the code will be overwritten when the BASIC program is run.

The program consists of six routines: NEW, SKIP, HIT, QUOTE, REM and UDATE.

The NEW routine is used whenever a new line is begun. It first checks the length of the new line. If it is one, then the end of the program being processed has been reached and a jump is made to BASIC. Otherwise, the address of this byte in the target program is pushed on the stack and its contents put in the B register.

The SKIP routine is branched to whenever a line number or reference is encountered. In such cases the program skips over the next two bytes being processed (they are line number codes).

The HIT routine examines successive bytes, checking to see if they are line-reference flags (9AH), end of lines (0DH), the beginning of REM statements (8FH) or quotation marks (22H). If any such bytes are encountered, there is a branch to the proper routine. Otherwise, the program checks for "true" spaces (20H). If the byte is not a space, the program loops back to HIT for another byte. If it is, you decrease the target pointer (so the next nonspace byte will occupy the byte it addresses) and decrease the contents of the B register that contains the number of bytes in the target line.

The QUOTE routine just cycles the bytes until another quotation mark is encountered. The REM routine does the same thing until the end of a line. The UDATE routine updates the number of bytes in the revised target

Rinaldo Prisco is an associate professor of mathematics at the State University of New York at Oswego, NY 13126.

```
0000                    0010 *            REMOVE
0000                    0020 *
0000                    0030 *       REMOVES BLANKS FROM
0000                    0040 *       PROGRAMS IN N* BASIC
0000                    0050 *
0000                    0060 *         RINALDO F. PRISCO
0000                    0070 *
0000                    0080 *
0000 11 93 5B           0090         LXI   D,5B93H
0003 21 93 5B           0100         LXI   H,5B93H
0006 1A                 0110 NEW     LDAX  D
0007 77                 0120         MOV   M,A
0008 FE 01              0130         CPI   1
000A CA 04 2A           0140         JZ    2A04H
000D E5                 0150         PUSH  H
000E 47                 0160         MOV   B,A
000F 23                 0170 SKIP    INX   H
0010 13                 0180         INX   D
0011 1A                 0190         LDAX  D
0012 77                 0200         MOV   M,A
0013 23                 0210         INX   H
0014 13                 0220         INX   D
0015 1A                 0230         LDAX  D
0016 77                 0240         MOV   M,A
0017 23                 0250 HIT     INX   H
0018 13                 0260         INX   D
0019 1A                 0270         LDAX  D
001A 77                 0280         MOV   M,A
001B FE 9A              0290         CPI   9AH
001D CA 0F 00           0300         JZ    SKIP
0020 FE 0D              0310         CPI   0DH
0022 CA 4E 00           0320         JZ    UDATE
0025 FE 8F              0330         CPI   8FH
0027 CA 45 00           0340         JZ    REM
002A FE 22              0350         CPI   22H
002C CA 39 00           0360         JZ    QUOTE
002F FE 20              0370         CPI   20H
0031 C2 17 00           0380         JNZ   HIT
0034 2B                 0390         DCX   H
0035 05                 0400         DCR   B
0036 C3 17 00           0410         JMP   HIT
0039 23                 0420 QUOTE   INX   H
003A 13                 0430         INX   D
003B 1A                 0440         LDAX  D
003C 77                 0450         MOV   M,A
003D FE 22              0460         CPI   22H
003F C2 39 00           0470         JNZ   QUOTE
0042 C3 17 00           0480         JMP   HIT
0045 23                 0490 REM     INX   H
0046 13                 0500         INX   D
0047 1A                 0510         LDAX  D
0048 77                 0520         MOV   M,A
0049 FE 0D              0530         CPI   0DH
004B C2 45 00           0540         JNZ   REM
004E 23                 0550 UDATE   INX   H
004F 13                 0560         INX   D
0050 E3                 0570         XTHL
0051 78                 0580         MOV   A,B
0052 77                 0590         MOV   M,A
0053 E1                 0600         POP   H
0054 C3 06 00           0610         JMP   NEW

SYMBOL TABLE

HIT   0017    NEW   0006    QUOTE 0039    REM   0045
SKIP  000F    UDATE 004E
```

Listing 1. Machine-language Blank Removal program.

line of BASIC and branches to the NEW (line) routine.

Concluding Remarks

The first time I used the program in Listing 1, I thought something was wrong with it since the BASIC prompt READY appeared almost as soon as it was loaded. But when the BASIC program was listed, all the blanks were gone, just as they were supposed to be. I tested the BASIC program with a RUN and it ran perfectly, as did several others I tested.

It never ceases to amaze me after working in BASIC for a while just how fast a machine-language program seems to run. I hope that you get as much use out of this program as I have.■



By Netronics

ASCII/BAUDOT, STAND ALONE

Computer Terminal

COMPLETE FOR ONLY... $149.95

The Netronics ASCII/BAUDOT Computer Terminal Kit is a microprocessor-controlled, stand alone keyboard/terminal requring no computer memory or software. It allows the use of either a 64 or 32 character by 16 line professional display format with selectable baud rate, RS232-C or 20 ma. output, full cursor control and 75 ohm composite video output.

The keyboard follows the standard typewriter configuration and generates the entire 128 character ASCII upper/lower case set with 96 printable characters. Features include onboard regulators, selectable parity, shift lock key, alpha lock jumper, a drive capability of one TTY load, and the ability to mate directly with almost any computer, including the new Explorer/85 and ELF products by Netronics.

The Computer Terminal requires no I/O mapping and includes 1k of memory, character generator, 2 key rollover, processor controlled cursor control, parallel ASCII/BAUDOT to serial conversion and serial to video processing—fully crystal controlled for superb accuracy. PC boards are the highest quality glass epoxy for the ultimate in reliability and long life.

VIDEO DISPLAY SPECIFICATIONS

The heart of the Netronics Computer Terminal is the microprocessor-controlled Netronics Video Display Board (VID) which allows the terminal to utilize either a parallel ASCII or BAUDOT signal source. The VID converts the parallel data to serial data which is then formatted to either RS232-C or 20 ma. current loop output, which can be connected to the serial I/O on your computer or other interface, i.e., Modem.

When connected to a computer, the computer must echo the character received. This data is received by the VID which processes the information, converting to data to video suitable to be displayed on a TV set (using an RF modulator) or on a video monitor. The VID generates the cursor, horizontal and vertical sync pulses and performs the housekeeping relative to which character and where it is to be displayed on the screen.

Video Output: *1.5 P/P into 75 ohm (EIA RS-170)* • **Baud Rate:** *110 and 300 ASCII* • **Outputs:** *RS232-C or 20 ma. current loop* • **ASCII Character Set:** *128 printable characters—*



BAUDOT Character Set: *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z - ? : * 3 $ # ( ) . , 9 0 1 4 ! 5 7 ; 2 / 6 8* • **Cursor Modes:** *Home, Backspace, Horizontal Tab, Line Feed, Vertical Tab, Carriage Return. Two special cursor sequences are provided for absolute and relative X-Y cursor addressing* • **Cursor Control:** *Erase, End of Line, Erase of Screen, Form Feed, Delete* • **Monitor Operation:** *50 or 60Hz (jumper selectable.*

Continental U.S.A. Credit Card Buyers Outside Connecticut

CALL TOLL FREE 800-243-7428

To Order From Connecticut Or For Technical Assistance, Etc. **Call (203) 354-9375**

Netronics R&D Ltd., Dept. K-1

333 Litchfield Road, New Milford, CT 06776

Please send the items checked below—

- ☐ **Netronics Stand Alone ASCII Keyboard/Computer Terminal Kit, $149.95** plus $3.00 postage & handling.
- ☐ **Deluxe Steel Cabinet** for Netronics Keyboard/Terminal In Blue/Black Finish, **$19.95** plus $2.50 postage and handling.
- ☐ **Video Display Board Kit** alone (less keyboard), **$89.95** plus $3 postage & handling.
- ☐ **12" Video Monitor** (10 MHz bandwidth) fully assembled and tested, **$139.95** plus $5 postage and handling.
- ☐ **RF Modulator Kit** (to use your TV set for a monitor), **$8.95** postpaid.
- ☐ **5 amp Power Supply Kit** In Deluxe Steel Cabinet (±8VDC @ 5 amps, plus 6-8 VAC), **$39.95** plus $2 postage & handling.

Total Enclosed (Conn. res. add sales tax) $_____

By—

☐ Personal Check ☐ Cashiers Check/Money Order

☐ **Visa** ☐ **Master Charge** (Bank # ____)

Acct. # _____

Signature _____ Exp. Date _____

Print Name _____

Address _____

City _____

State _____ Zip _____

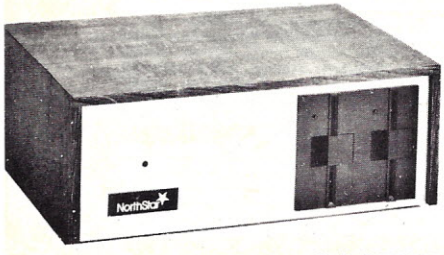
☐ **Send Me More Information**

✓ Reader Service—see page 226

If North Star or Cromemco offer it . . .

WE HAVE IT!!

Immediate Delivery at Discount Prices



NORTH STAR Horizon® 2

32K Double Density
Assembled and Tested
List $3095

ONLY $2619

ASSEMBLED

HORIZON 1, DD **$2279**	32K, QD, List $2995 ..... **2539**
HORIZON 2, 32K, DD . **$2619**	48K, QD, List $4090 ..... **3469**
32K, QD, List $3595 ..... **3049**	64K, DD, List $3830 ..... **3239**
48K, DD, List $3590 ..... **3039**	64K, QD, List $4330 ..... **3669**

NORTH STAR APPLICATIONS SOFTWARE

(Exclusive for use with North Star Disk Systems — specify Double or Quad Density)

NORTHWORD, List $399 ..... **$339**
MAILMANAGER, List $299 ..... **249**
INFOMANAGER, List $499 ..... **419**
GENERALLEDGER, List $999 ..... **799**
ACCOUNTSRECEIVABLE, List $599 ..... **499**
ACCOUNTSPAYABLE, List $599 ..... **499**

NORTH STAR HARD DISK HD-18

18 megabytes, plugs into parallel port of North Star Horizon. Utilizes tried-and-proven 14" Century Data Marksman. List $4999.

OUR PRICE $4199

NORTH STAR MDS-A — Double (or Quad) Density Disk System, Kit, List $799 . **OUR PRICE $669**
Assembled and Tested, List $899 **SPECIAL $719**

NORTH STAR MEMORY BOARDS

16K Dynamic RAM (RAM-16-A/A), Assembled, List $499 ..... **$420**
Kit, List $449 ..... **SPECIAL $299**
32K (RAM-32/A), Assembled, List $739 ..... **$620**
Kit, List $669 ..... **ONLY $499**

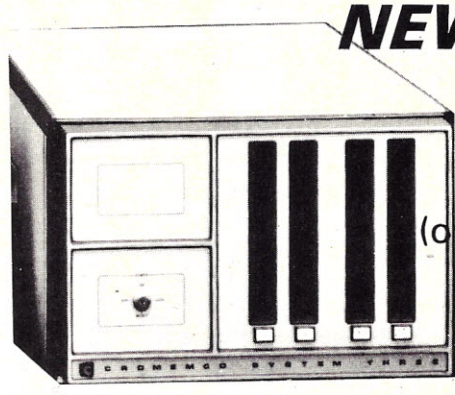
INTRODUCTORY SPECIALS ON ...

PREMIUM QUALITY BASF DISKS
CERTIFIED FOR QUAD SYSTEMS

(Box of ten)

5¼" DOUBLE DENSITY DOUBLE SIDED List$57.50 ... **$38.95**
8" DOUBLE DENSITY DOUBLE SIDED List$75.00 .... **$47.49**

Shipping $2.50 — Free Shipping In Multiple Of Two Box's



NEW System 3 by CROMEMCO

Now with Dual Double Sided Double Density (over 2 megabytes of Storage) 64K of RAM
List $7395

LIMITED TIME INTRODUCTORY SPECIAL $6199!

CROMEMCO SYSTEM 2 — Now double Density with Double Sided Drives, Quad Capacity mini floppy disc drives. List $3990 ..... **Only $3390**

CROMEMCO Z-2H



Full 11-megabyte Hard Disk system. Fast Z-80A 4 MHz processor, two floppy disk drives, 64K RAM memory, RS232 special interface, printer interface, and extensive software available.
List $9995

OUR PRICE $8489

NEW DOUBLE DENSITY CONTROLLER BOARD From Cromemco

With built-in diagnostics — 16 FDC Controller
List $595 ..... **OUR PRICE $505**

Z-2 COMPUTER SYSTEM List $995 ..... **$845**
SINGLE CARD COMPUTER — SCC-W 4 MHz. List $450 ..... **$382**
NEW COLOR GRAPHICS INTERFACE — SDI List $595 **OUR PRICE $505**

CROMEMCO HDD — 11/22-megabyte Hard Disk for use with existing systems. DMA controller. Transfer rate of 5.6 megabytes/second.
HDD-11. List $6995 ..... **OUR PRICE ONLY $5939**
HDD-22. List $11,995 ..... **$10,189**

SHIPPING AND INSURANCE: Add $15 or Horizons, $2.50 for Boards and Software. Hard Disk Systems and Cromemco systems shipped freight collect. Advertised prices are for prepaid orders. Credit card and C.O.D. 2% higher. Deposit may be required on C.O.D. All prices subject to change and offers subject to withdrawal without notice.

— WRITE FOR FREE CATALOG —

✓275

MiniMicroMart, Inc.

1618 James Street, Syracuse, NY 13203 (315) 422-4467 TWX 710-541-0431

master charge THE INTERBANK CARD

VISA

Here's an aid for disorganized or beginning computer users who find themselves drowning in paper.

Managing the Small System Environment

By Steven K. Roberts

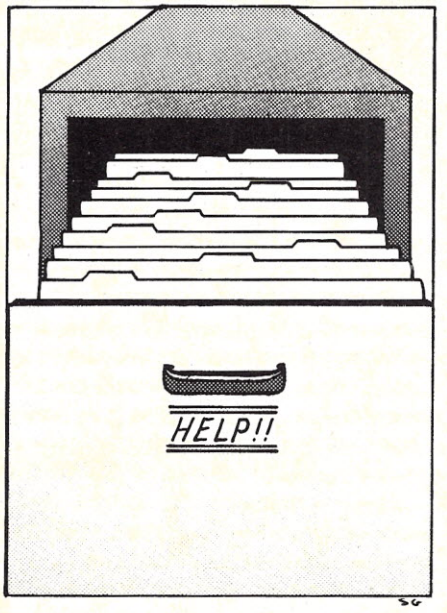
It starts out innocently enough. You clear a space, install a computer and plug it in. You play with it a bit, juggle some I/O drivers, initialize a few disks, bring up an applications package or a language of choice and find yourself with a system.

You are on line.

You possess a powerful tool, a relentlessly educational toy and, if you're not careful, a guaranteed ticket to insanity. Whether your reason for all the effort is business, software development, general utility, music or simply an obsession with computers, you have created a set of environmental requirements that cannot be ignored: from the tiniest microprocessor to the strange world of Amdahl and Cray, computers need organization.

More accurately, people need organization. Two years after implementing a convenient little I/O driver patch, you may change peripherals and need to unpatch it. At 300 revolutions per minute, a minifloppy rotates over 150 million times in a year of continuous operation—it needs replacement and the heads need cleaning. The wiring of a cable, the revision levels of the boards and the hardware patches may all become important when a problem develops.

Files get misplaced. I/O port assignments are forgotten. Data bases have no backups. What happened to the idea of "computer as appliance"?



Unless your system is a sealed black box with a dedicated function, you may be in for some unwelcome surprises—unless, of course, you incorporate into your installation a few techniques of site management. The definition of the term "system" must be expanded to include your environment.

Levels of Organization

Outside the comfort of the card cage and the confines of an operating system, it's a cruel and confusing world. The most elegant and beautifully integrated system architecture can be mired in poor documentation. Too often, the computer manufacturer or software vendor creates problems up front by ignoring this central fact, and a user saddled with such a system is, alas, usually powerless to do anything about it.

But assuming a quality system with reasonable documentation, you are in a position to implement a smooth-running, efficient installation. Attention to six major areas of system organization can make this possible, and make life happier for all concerned.

Hardware documentation—Oddly, this is frequently overlooked despite its almost automatic nature: manufacturers provide manuals, and hardware changes are seldom made without notes. Yet some "minor" details are easy to forget.

System documentation should start with a file cabinet or, at the very least, a dedicated file drawer. The hardware section should begin with records of purchases, warranties

Steve Roberts is a freelance writer and industrial microprocessor systems consultant residing near Columbus, OH. He has been involved with small system design and applications since the early 1970s and is the author of Micromatics *(Scelbi Publications, Elmwood, CT, 1980), as well as about 30 magazine articles. His address is 5885 Dublin Road, Dublin, OH 43017.*

with the registration dates noted and the serial numbers of all equipment. In case of equipment failure or loss, this information can prove suddenly indispensable.

A second hardware file should be for factory support, with the names and phone numbers of knowledgeable people at the various manufacturers represented in the system. This is a good place for merchandise return forms, the names of a few local wizards and names of some other users of the same equipment.

Third, you should have accurate and up-to-date records of all changes and modifications made to the system: cable wiring, modifications to circuit boards and those temporary patches that somehow become permanent. Even such trivial items as a remote reset switch should be documented in the form of a sketch and filed.

A fourth file might be labeled, "Things to Do." There is good reason to avoid frequent power cycles on a computer, and minor changes and additions, such as optional PC board modifications suggested by the manufacturer, can often wait until the next major shutdown. An organized queue of patches can help keep the system configuration up-to-date.

Fifth, you should have a file which documents the current system configuration. What boards are installed? How many spare edge connectors are there? Which memory board corresponds to which address range? What are the I/O port assignments?

This should also include a sketch of the overall system, showing all cables. You'll appreciate a good configuration diagram when the system is moved to a new home.

And then, of course, you might have any number of hardware files detailing the various elements of the system. Kit plans, schematics, theory of operation and any other data relating to specific boards or peripherals should be sorted into convenient subheadings (16KZ memory board, Diablo Printer, Hazeltine 1500, homemade modem, etc.). Again, the easy availability of documentation about the system hardware can save time and frustration when it is time to repair, replace or modify the machine.

Maintenance—Immediately following the hardware section in the file cabinet, there should be a maintenance section. It should contain four files:

Hardware Section	
Purchase Records	Factory Support
Modifications	Things to Do
System Configuration	16KZ Memory Boards
Z-2D Kit Plans	Diablo Printer
Hazeltine 1500	Modem
Analog Hardware	Music Hardware
Home Control System	
Maintenance Section	
Maintenance Log	Questions & Problems
PM Schedule	Media Life Records
Environmental Software Section	
I/O Drivers	Revision Log
Questions & Problems	Memory Map
CDOS	BASIC
ASMB	FORTRAN
DBMS	TRACE
FORMAT	COBOL
LISP	
Applications Software Section	
Music Programs	Corning Job
Graphics	Communications
Games	Home Control System
Payroll	GL
AR	AP
Inventory	Backup Log
Operations Section	
Procedures	Master File Directory
Library Section	
Magazine Indexes	Library Routines
Clippings—Software	Clippings—Hardware

Typical computer room file organization.

First, the system maintenance log. This is important! Every fix, every problem and solution should be noted for future reference. No matter how obvious the solution, it will probably be forgotten 18 months later when the same failure occurs again. A quick scan of the maintenance log might reveal the identical problem and prevent a lot of head-scratching.

Second, you should have a "Question and Problems" list. Periodic conversations with the manufacturer yield more useful information if all of the accumulated questions are in front of you while you talk. It is too easy to forget half the things you wanted to ask.

Third, a preventive maintenance (PM) schedule is a must. Printers need to be oiled, filters and heads need to be cleaned, and analog portions of the system need periodic calibration. These things are normally forgotten in the complacency of smooth system operation, then regretted much later when failure results.

And last, the maintenance section should include the dates of acquisition of the system media—diskettes and cassettes in particular. This alone will not give an index of media use and optimal replacement time, but it will aid in keeping track of its age. Diskettes do fail from extended use—believe me.

Software documentation (environmental)—The environment in which application jobs run and in which development work is accomplished consists of an operating system, a monitor and various resources such as assembler, BASIC, COBOL, data base management system, text editor, text formatter and debugger. Also, you can have miscellaneous custom utilities, I/O drivers different from those provided with the system and macro libraries. All this code can be loosely lumped into the "environmental" category, and most of it is usually documented in the form of manuals. Keep the latest ones around, and put the others in the attic.

Patches to the operating system probably occur most often in the area of communication with I/O devices. A software driver for a daisy wheel printer or a memory-mapped CRT represents a key link between the system and the outside world—the

documentation which defines it should not become buried in the inevitable computer room piles of paper, but should become file number one in the software section.

Like hardware, only changing more rapidly, software is identified by revision numbers. A complete record of these, along with any software registration forms, should be available at a glance. The first question asked by a software vendor when confronted by a request for help is usually, "What revision do you have?"

This file should also note, by diskette number, which revisions of the various pieces of environmental software exist on each piece of media. With 50 diskettes and six different revisions of the operating system, confusion can reign supreme (especially in situations where subsequent revisions are not compatible).

Again, you should have a file of questions and problems for the software supplier. If there is an obscure glitch in BASIC, it should be noted here so that the vendor can be informed and possibly provide a solution.

An important element in your environmental software file is a memory map. This is a drawing of the system's address space showing the regions occupied by the operating system, user RAM space, stack area, ROM locations, the addresses of any memory-mapped I/O devices and so on. When you are adding a patch and looking for a buffer area that will not plague you in the future, this can be a big help.

Software documentation (applications)—The organization of information relating to applications software is very much a function of its volatility, whether you are its user or creator. If you are a user of an applications package, the principles outlined above apply, since it can be considered part of the system environment.

If the system is being used to generate new software, however, we have what could accurately be termed a can of worms. Revision numbers whiz by, sometimes up to the hundreds before the design is frozen and the program is delivered or put to work. This level of activity calls for careful management, both in the system and in the file cabinet.

There should be records, of course, defining the design criteria and the programming philosophies of which the software is comprised, filed by program or, in the case of small jobs (like "Miscellaneous Music Programs"), by category. Sample runs, memory utilization maps, debugging notes and latest listings should be filed together by job.

At the system level, you'll want to reflect the revision number in the filename. Most systems provide the option of simply editing a source file by its existing name, producing a .BAK file as well as the new one, or creating a new name each time and using the old one as the input file. In the case of a complex project, the latter is preferable. In the case of text files and simple programs, the former is adequate. The difference lies in the amount of historical information that may be important in the evolution of the work.

In either case, you should have many backups, scattered across a minimum of three diskettes. The presence of multiple revisions on a single diskette is little comfort when an error message indicates a nonrecoverable media error in the directory—a rare, but crippling, event.

Operations—The area of system operations—the day-to-day running of the computer—is one in which some planning in the early stages of the system's existence can pay off continuously throughout its operating life.

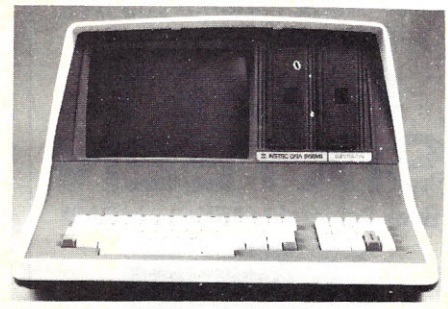
Operator conveniences work wonders. An ASCII code chart on the wall, reference cards near the console and a supplies drawer containing EPROMs, connectors, printer ribbons, typewheels, oil, head cleaning supplies, diskette labels, a forms ruler, razor knife and more felt pens than you'll ever use will make life in the computer room easy. The less you have to run around tracking down trivia, the better.

In the file cabinet, you should retain written procedures for the tasks that have not become second nature; e.g., patching the operating system with new I/O vectors, performing a CONFIG or loading certain debugging utilities. Strange but true, it is possible to forget some of the less frequently used procedures.

If the system has not yet been equipped with a multimegabyte hard disk, the problem of organizing dozens of diskettes must be faced. In the case of minifloppies (5 inch), the organization of an active system can create considerable confusion. This can be minimized by—you guessed it—careful planning.

First, the diskettes should be se-

SUPERBRAIN®



32K or 64K (Double or Quad Density units available). Uses two Z-80 CPU's. Commercial-type terminal with 12" monitor. Dual double density minifloppies. Over 350 kilobytes of storage (twice that with quad density drives). Two serial RS232 ports, I/O ports standard. Expandable with optional S-100 S-100 interface. Comes with CP/M™ 2.2 operating system. MiniMicroMart includes BASIC interpreter and can supply a wide range of CP/M Development and Application software.

w/32K Double Density, List $2995 . **$2685**
w/64K Double Density, List $3345 ..... **$2883**
w/64K Quad Density, List $3995 ..... **$3595**
64K Special Quad Version **$3395**

INTERSYSTEMS
formerly ITHACA AUDIO



DPS-1, List $1795

Call for Price!

The new Series II CPU Board features a 4 MHz Z-80A CPU and a full-feature front panel. 20-slot actively terminated motherboard, with 25 amp power supply (50/60 Hz operation, incl. 68 cfm fan).

COMPLETE SYSTEM with InterSystem 64K RAM, I/O Board w/priority interrupt and double density disk controller board. Full 1-year warranty, List $3595

HEWLETT-PACKARD HP-85A



F.O.B. shipping point. All prices subject to change and all offers subject to withdrawal without notice. Advertised prices are for prepaid orders. Credit card and C.O.D. 2% higher. C.O.D. may require deposit.

— WRITE FOR FREE CATALOG — ✓304

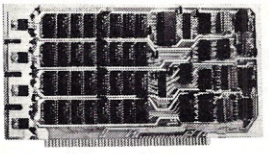
MiniMicroMart
1618 James Street
Syracuse, NY 13203 (315) 422-4467

✓Reader Service—see page 226

Now-Break Through The 64K Micro-Memory Limit!

SWEET SIXTEEN

Bank Selectable 16K Static RAM



SAVE $50.00
LIMITED TIME OFFER

Don't buy any more antique RAMs (RAM without bank select) — now there's Netronic's new SWEET SIXTEEN board featuring a universal software bank select system. SWEET SIXTEEN is capable of addressing 2,048 different banks. With SWEET SIXTEEN boards you can add memory beyond the 64K limit, or expand to a multi-terminal system.

LOOK AT THESE FEATURES:

- **300 NS, low power 2114's.**
- **Software Bank Selector** — Universal decoder works with Cromenco, Alpha Micro, Netronics, most other systems, or your design. Onboard dip switches: Bank Select Enable; Reset Enable; Reset Disable; Port Address; Port Data.
- **All Inputs And Outputs** meet the proposed IEEE standards for the S-100 bus.
- **4.0 MHz Operation.**
- **Schmitt Trigger Buffer** on all signals for maximum noise immunity.
- **Addressable On 16k Boundaries,** 0-64k, dip switch selectable.
- **Phantom Option,** dip switch selectable.
- **PWR/MWRITE Option,** dip switch selectable.
- **LED Indicator** to display status.
- **Glass Epoxy PC Board** with gold-plated contacts and double-sided solder mask.
- **Fully Socketed.**
- **Four Separate Regulators** for maximum stability.

10-Day Money-Back Policy For Wired & Tested Unit: Try a fully wired board — then either keep it, return it for kit, or simply return it in working condition.

Continental U.S.A. Credit Card Buyers Outside Connecticut:

CALL TOLL FREE:
800-243-7428
From Connecticut Or For Assistance:
(203) 354-9375

Please send the items checked below:

☐ **SWEET SIXTEEN kit; No. S-16** . . . (reg. price $249.95) now $199.95*

☐ **SWEET SIXTEEN, fully assembled, tested, burned in; No. S-16W** . . . (reg. price $289.95) now $239.95*

*Plus $2 postage & insurance. Connecticut residents add sales tax.

Total Enclosed: $ _____

☐ Personal Check ☐ Money Order/Cashier's Check
☐ VISA ☐ Master Charge (Bank No. _____)
Acct. No. _____ Exp. Date_____

Signature _____
Print
Name _____
Address _____
City _____
State_____ Zip _____

NETRONICS
RESEARCH & DEVELOPMENT, LTD. KB1
333 Litchfield Rd., New Milford, CT 06776

quentially numbered (irrespective of their contents) and separated into broad categories. There may be disks for writing and storing BASIC programs, disks for creating text files and disks for data base. The point is to separate them by function; this will eliminate the confusion that can result from having articles, I/O drivers, a COBOL accounting job and miscellaneous BASIC programs on the same diskette.

Second, any critical file should be copied onto one of a number of general backup diskettes, which are stored in a different location from those in daily use. A fire, the catastrophic introduction of a magnet into the room or a careless coffee spill can have dismaying effects if all of the system files are in the same box. If you are doing custom software and possess absolutely irreplaceable data, invest in a safe deposit box. It's cheap insurance.

Third, you can keep track of all those files by periodically preparing a master directory of all of your diskettes and manually updating it as the files evolve. It would be pleasant to dedicate an additional drive to the system, along with appropriate support software, to automatically update a master directory file each time the directory of another disk is changed. This, along with some dedicated data base techniques, would effectively solve the problem of organizing a system environment consisting of large numbers of floppies.

Lacking that convenience, however, generating a complete directory manually at appropriate intervals considerably simplifies the task of finding a long-dormant file.

And fourth, each diskette should carry a brief text file for identification. A convenient way to name this file is IDENT.MYY, where M is a month code (0–9, A and B) and YY is the year of the most recent change in the IDENT file. The file consists of the diskette number, its acquisition date and a brief summary of its use and present function, including any error incidents. This, printed with its directory upon each generation of the master directory file, fills the missing links in the system files' documentation.

Attention to these and similar aspects of system operation can make computer use much more pleasant than it is when confusion reigns. Organizational techniques add little to the operating overhead, but pay off handsomely in convenience.

The computer room library—There are sources of pertinent information that need not be integrated with the active system files, disk and otherwise, that we have discussed so far. These are vendor literature, magazines and books. There are thousands of published programs which together represent a powerful resource to the microprocessor user, along with hardware articles and philosophical comments. How can you possibly use this massive resource effectively?

The fundamental solution is a computer room library, cross-referenced as heavily as your time permits. The problem, of course, is that the sheer volume of information can make this cross-referencing a prohibitive task. Even with the use of a data base management system, time required to update may be too expensive to consider.

An intermediate solution is the creation of another category in the system file cabinet. Use it to save annual indexes from the magazines, notes about articles of particular interest and photocopies or clippings of immediate interest. Published information can be a real time-saver, and it is worth trying to organize it.

Conclusions—If you find yourself plagued by relentless stacks of papers that are too valuable to toss out but too numerous to try to organize, take the time to create a file drawer. Starting with the categories outlined in this article, add files that fit the requirements of your own unique installation and of your work. When you have a definite place to file almost any piece of information, those piles take a lot longer to form.

Until we have self-documenting systems, large cheap disks that back themselves up and hardware and software so perfect that documentation is superfluous beyond the "how to use it" level, we will have problems in organizing the small system environment. These requirements are an established part of the data processing industry, but only with the recent proliferation of microprocessors have they arrived in such force at the doorstep of the small businessman and hobbyist.

But as long as the potential user is equipped with the organizational techniques to deal with this flood of information, the threat posed by computers to his or her sanity can be held at bay.■

Want to **REALLY UNDERSTAND** The **BASIC** Language?

From the author of the highly acclaimed TRS-80 Users/ Learners Manual comes the book you've been asking for! The BASIC Handbook is THE definitive reference and "idea" book, explaining in detail the BASIC language as used in over 50 favorite micros, minis and mainframes.

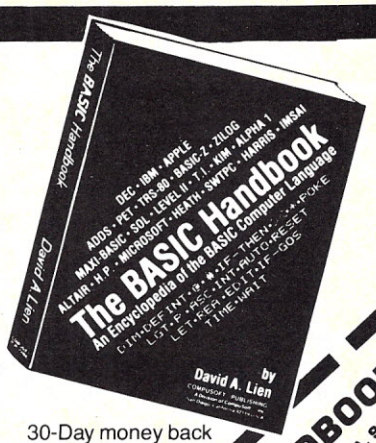
It's not a dictionary, and not a textbook, but a virtual ENCYCLOPEDIA of the BASIC language. In it is everything you need to know about the most important BASIC statements, functions, operators and commands, explained in a way that you can put them right to work.

This HANDBOOK is written to be used!

With the BASIC Handbook you can finally make those programs found in magazines run on your computer – or know the reason why they can't.

If there is an alternate way to write a program using other BASIC words, the Handbook shows you how. If there is a function needed but your machine doesn't have it, the Handbook gives you a subroutine that accomplishes the same thing. About the only thing it won't help you with is an additional 16K of memory.

Is TRS-80 Level II covered – YES!
Is PET covered – YES!
Is Apple covered – YES!
Sorcerer, Altair, Imsai, Etc.
YES . . . . and over 50 more!



360 pages
Soft Cover

30-Day money back Guarantee

COMPUSOFT™ PUBLISHING ↙32
A Division of CompuSoft, Inc.
San Diego, California 92119

Order Today!

YES, I need the BASIC HANDBOOK
CompuSoft Publishing, 1050E Pioneer Way, Dept. K1, El Cajon, CA. 92020
(714) 588-0996

Please send ____ copies of The BASIC Handbook. My check for $14.95 each + $1.35 P & H is enclosed. (California add 6% tax)

Name _____
Address _____
City _____ State _____ Zip _____

master charge
VISA

HIGH RELIABILITY FOR TRS80—I *
DISK DRIVES
LOW HEAT DESIGN-35 TRACK RELIABILITY
DOUBLE DENSITY COMPATIBILITY-4 DRIVE POWER SUPPLY SAME VOLTAGE REGULATION
SPEED REGULATION-DATA SEPARATION AVAILABLE-TRACK FIDELITY-PERFORMANCE INSTRUCTION
BARE DRIVE $249.00-4 DRIVES W/PS $1199.00
CABLE $59.00-4 DRIVES CABINETS $150.00
LINEPRINTER
BIDIRECTIONAL-SPECIAL CHARACTERS-GRAPHICS-DOUBLE SIZE 40 COLUMN-STD80 COLUMN-CONDENSED 132 COLUMN
SOFTWARE CONTROLS-FEATURES EXPANDABLE-5 COPIES W/O CARBON-ADJUSTIBLE WIDTH FANFOLD PAPER
SPACE SAVER DESIGN-OWNER MAINTAINABLE-3 MILLION CHARACTER OVERHAUL-SMALL BUSINESS PRINTER
LINEPRINTER $650.00-CABLE $59.00-PAPER $49.00
16K MEMORY
16K MEMORY SET $98.00
WORD PROCESSING SOFTWARE
DISK BASIC-SIMPLE TO USE-BUG FREE-EXPANDABLE WITH MAIL LIST AVAILABLE LATER
WP4/CMD $79.00
DELIVERY 4 WEEKS, PAYMENT IN ADVANCE, ADD SHIPPING CHARGES
TANG DATA CORPORATION ↙350
617-872-9666
100 EAMES STREET, FRAMINGHAM, MA 01701
***TRS80-I TRADE MARK OF TANDY RADIO SHACK

Audio signal analysis for your PET from Eventide Clockworks.

Real-Time Spectrum Analyzer

By Robert Baker

Eventide Clockworks (265 West 54th Street, New York, NY 10019) offers several accessories for the PET/CBM. Of special interest is their THS224 Real Time 1/3 Octave Audio Analyzer.

Eventide provides all necessary hardware with the board. Power comes from the PET transformer, but not from its regulators. Installation of the analyzer allows rapid and versatile analysis of virtually any audio signal. Additional capabilities include voice recognition, statistical processing and room acoustics. The analyzer does not affect normal operation of the computer.

The analyzer board is mounted inside the PET, with spacers holding the board several inches above the PET main logic board. Two cables then connect the analyzer to the memory expansion connector(s) and the power connector of the PET. Another cable from the analyzer board attaches to a standard stereo jack, with a small metal bracket to mount it on the back of the PET. This connector supplies the audio input signal to the analyzer.

A ROM on the analyzer board provides various routines to control the associated hardware. The ROM occupies locations $B000 to B3FF hex on the PET address space. To save you the bother of memorizing many addresses, the USR function provides the linkage to the PET operating system. By calling various USR functions, the machine-language routines are accessed conveniently by BASIC programs.

On the newer 16K/32K PETs, you must alter a configuration jumper on the PET's main logic board to let the computer access the analyzer. Two jumpers control the selection of the empty ROM sockets during the 9, A and B selection times. By changing these jumpers, the analyzer board is then accessed by these address ranges.

Once these jumpers are changed, however, you cannot use any product that requires a ROM in the normally open ROM sockets (such as Word Pro or the Toolkit). This also prohibits upgrading to BASIC 4.0 ROMs, since there are five ROMs in the new set. Another reason for not being able to upgrade to BASIC 4.0 is that the analyzer uses areas of RAM in the second cassette buffer, which is also used by BASIC 4.0 when processing disk commands.

What Is Real Time?

The Eventide THS224 is classified as a "real-time, constant percentage bandwidth" spectrum analyzer. A real-time analyzer continuously analyzes all components of interest in the input signal and provides information in some usable form. This is in contrast to, for instance, the swept filter type of analyzer, which can analyze only one frequency at any given time.

There are three general methods of performing real-time analysis. The first, as used in this unit, provides a large number of bandpass filters so that all components are analyzed simultaneously. The other methods involve digital capture of signal segments and their processing, either by analog or digital techniques. While the latter two methods are in many cases more powerful, their disadvantages, such as high cost and slow speed, render them unsuitable for applications in which audio spectra must be observed many times per second.

The constant percentage bandwidth consideration also enters the picture. The phrase means that each filter has a bandwidth which, when divided into its center frequency, yields a constant. For instance, if a filter has 3 dB points 2 Hz apart at a 20 Hz center frequency, another filter should have a 3 dB bandwidth of 20 Hz at a 200 Hz center frequency, and so on. This characteristic, fortunately, is almost unavoidably achieved when building filters using identical hardware configurations and different resistive or capacitive values to select the center frequency.

Theoretically, the filter center frequencies are derived by starting with the first frequency desired and multiplying each successive filter center frequency by one-third octave, or the cube root of 2. Since it is desirable to have the filters correspond to decade ratios as well, several standards organizations (ISO/ANSI/IEEE and others) have agreed on a set of center frequencies which nicely rationalize the disparate ratios. The filters used in the Eventide analyzer are two-pole filters with a Q of

Robert Baker, 15 Windsor Drive, Atco, NJ 08004.

10, which determines the bandwidth. They're all identical except for the resistor and capacitor values that determine the center frequencies, and the filter center frequencies conform to the standard values.

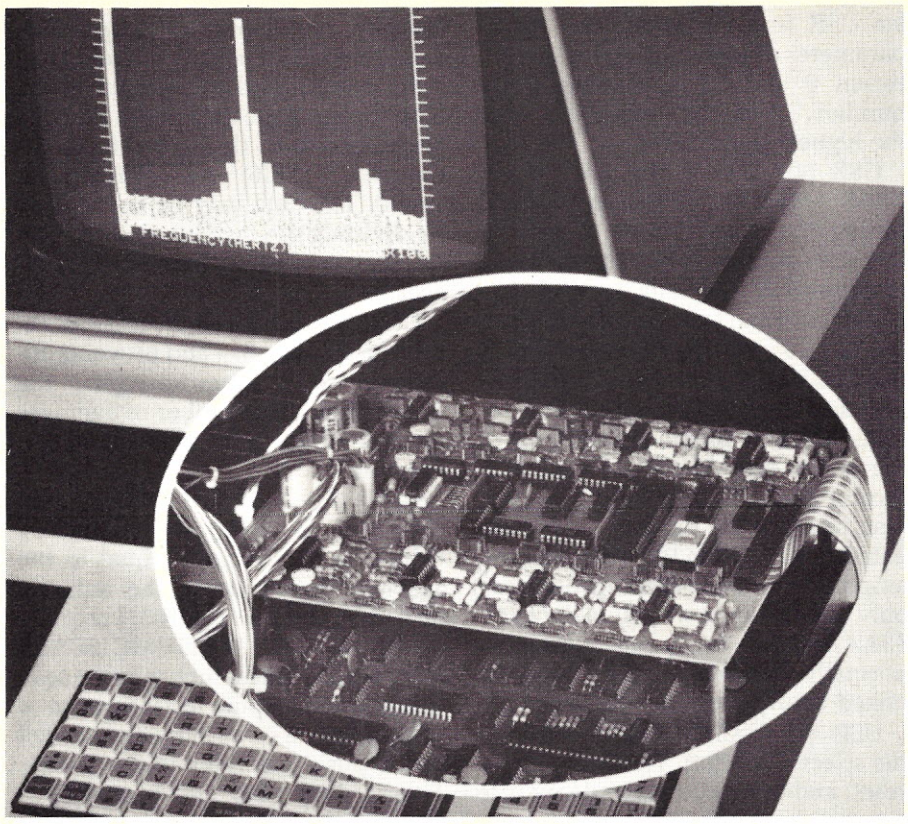
Although the input signal could be applied immediately to the filter inputs, it is customary and convenient to provide a variable gain preamplifier. The most important reason for this is to preserve an adequate dynamic range. The filter peak-to-peak output voltage swing is limited by the power supplies to almost 20 volts. The voltage measurement capability of the unit divides the positive half of this swing into 255 even steps. If the input signal were, say, only 2 volts, then only 25 steps could be measured and the accuracy and resolution of the analyzer would be drastically limited.

Operation

Variable gain is implemented in a somewhat unusual fashion in the Eventide analyzer. A standard operational amplifier in an inverting configuration is used as the "preamp." In the feedback loop of the opamp is a CMOS digital-to-analog converter (DAC) with its input code controlled by the PET. The DAC is of the "four quadrant multiplying" type, meaning that the reference input (connected to the preamp output) is multiplied by the digital word applied to the converter. If the maximum word (255) is applied, the reference is multiplied by one, giving an opamp gain of one; when the input code is 128 the gain is now 2, or 6 dB, and so on.

The gain available from the preamp is sufficient for almost all ordinary signal sources, such as audio consoles, hi-fi "aux" outputs, guitar pickups, etc. It is not sufficient for very low-level signals, such as dynamic microphones, phono cartridges and telephone pickup loops. An external preamp is recommended for this type of application.

Once the input signal is applied to the filters, it is separated into its various frequency components. With the filter outputs being ac signals, they may assume any value between their peak amplitudes. To make a measurement of their absolute values, the "envelopes" amplitude must be measured. This is done with a diode detector much like that used in an AM radio receiver. Whenever the filter output instantaneous amplitude is more positive than the voltage on the capacitor at the output of the filter, the diode conducts and the charge is transferred to the capacitor. The analyzer also has one diode detector that is directly connected to the input signal to measure the level of the composite input signal. In this case, all input signals, regardless of frequency, affect the charge on the capacitor.



Eventide's real-time audio spectrum analyzer plugs right into the PET.

To graphically display a spectrum, the various charges on the detector capacitors must be measured and converted to bar heights on the PET display. This is done in three steps:

- Scan the various filter outputs,
- Cause the A/D converter to measure the voltage on the detector capacitor, and
- Store the values in the second cassette buffer areas.

In practice, each of these steps is performed sequentially for each filter before going on to the next. The data collected is then processed by the various ROM routines provided on the analyzer board, however desired by the user software.

As mentioned earlier, the various machine-language routines contained in the analyzer ROM are accessed via USR functions. When first turned on, the PET has no knowledge that the analyzer is there. A specific SYS command must first be issued to initialize the analyzer board and preset the entry address for subsequent USR functions. Then the various USR functions are issued as desired.

USR (0)—DISABLE FUNCTION disables the analyzer and returns the PET to normal operation.

USR (1)—SCALE FUNCTION erases the PET screen and displays the blank graph scales for displaying analyzer data.

USR (2)—BARGRAPH FUNCTION fills in the axes displayed by USR (1). The data from which the graph is derived resides in the second cassette buffer, between memory locations $33A and 35A hex. This function can be used to plot any data contained in these locations, so the routine may be used with other BASIC programs.

USR (3)—SCAN FUNCTION performs the spectrum analysis, reading the amplitude of the input signal as passed by the individual filters. The results of the analysis are placed in the buffer between $33A and 35A as described before. The various modes of operation (logarithmic, linear, single, average, fast and slow) are active during the SCAN operation and directly affect the data placed in the buffer. The effect of each of these modes is described under its particu-

lar USR function later. The return parameter of USR(3) is an integer between 0 and 30, representing the number of the frequency cell with the highest signal level.

USR (4)—SLOW DECAY FUNCTION sets a flag which is accessed during the scan routine. Normally the scan routine takes the absolute amplitude of the data in each frequency cell and transfers it to the buffer location as described earlier. If the decay flag is set, the current amplitude data in any given cell is compared with the previous amplitude of the same cell. If the new data is greater than the old data, the new data replaces the old data. If the old data is greater than the new data, the amplitude is permitted to decrease only by an amount set in location $3A3 hex. The decay rate constant is normally initialized to 6 but may be poked to any desired value.

USR (5)—FAST DECAY reverses the effect of USR(4). The decay flag is reset, and the value of the decay rate constant becomes irrelevant.

USR (6)—AVERAGE FUNCTION places the analyzer in the average mode and zeroes two areas in the second cassette buffer used to store the data developed in the average mode. The first area is the number of averages counter, a double byte counter at locations $3A0-3A1 hex. When the average flag is set, the double byte counter is incremented each time a scan function is activated.

Simultaneously, the data from the various frequency cells is added to corresponding double byte cells in the new buffer area starting at hex location $35D. The data in these locations corresponds to the sum of the amplitudes of the data in the first displayable cell on the screen from the time that USR(6) was originally invoked. The data may be normalized by dividing the current data in each cell by the current number of averages.

USR (7)—DISABLE AVERAGE resets the average flag and prevents additional scans from changing the stored data. The number of averages mentioned above is returned by the function.

USR (8)—LINEAR causes the height of the bargraph created by USR(2) to be precisely equal to the absolute amplitude of the data returned by the scan [USR(3)] process.

USR (9)—LOGARITHMIC SCALE sets the LOG flag which tells the scan function to compute the logarithm of the amplitude in each frequency cell and deposit this value in the buffer. This is done after any averaging is performed and before any variable rate decay function is performed.

If any other USR argument is attempted, an error message will be displayed to indicate an illegal USR call was issued.

Upon initialization, a value of 128 decimal is poked into the gain control port located at 46080 ($B400 hex). This corresponds to a pre-amplifier gain of 6 dB (or a voltage gain of 2). The analyzer gain can be controlled by poking appropriate values into this location. The rule is that the signal gain increases by 6 dB for each division by 2 of the data poked into address 46080. Warning: poking a value of zero will remove all feedback from the operational amplifier. This results in unstable operation that will not damage the analyzer, but the display will be unstable and incorrect.

The analyzer board comes with three programs on cassette, a Mylar overlay for the keyboard and all necessary installation hardware. The programs include diagnostic and calibration routines along with a program called Interactive. This is a general-purpose utility program for ordinary use of the analyzer. It provides control of the various analyzer functions directly from the keyboard. The keyboard overlay identifies specific keys that are used when running the Interactive program. It also provides a handy reference of all USR functions and buffer locations.

Summary

The analyzer is a well-designed accessory for the PET. It comes with a six-month warranty, extensive documentation and several interesting applications notes. The manual even includes a complete schematic, parts list and board layout diagram. It's a valuable and worthwhile accessory that should be of interest to many PET owners. Write to Eventide Clockworks for pricing and further information. Various versions are available to cover all model PETs. Just remember the restrictions on using additional ROMs and the second cassette buffer.■

— Professional —
Real Estate Software
For Apple or TRS-80
Property Management System
(32K, 1 Disk Systems)
Features:
- Tenant Information
- Late Rent Reports
- YTD & Monthly Income
- Handles — Partial Payments, Returned Checks, Advance Payments
- Prints Receipts
- 5 Digit Expense Accounts
- Building Expense Report
- Vendor Expense Report
- Income Tax Report
- All Reports Can Be Printed
- Complete Documentation
- Easy Data Entry & Edit
- 200 Units per File

Price $225.00
Real Estate Analysis Modules:
(Cassette or Disk)
1) Home Purchase Analysis
2) Tax Deferred Exchange
3) Construction Cost/Profit
4) Income Property Cashflow
5) APR Loan Analysis
6) Property Sales Analysis
7) Loan Amortization
$35 Per Module
At Computer Stores Everywhere
Or Order COD Direct
(Cal Residents Add 6% Sales Tax)
(213) 372-9419
Software Realty Company™
Dept. K 1116-G Eighth St. Manhattan Beach, CA 90266

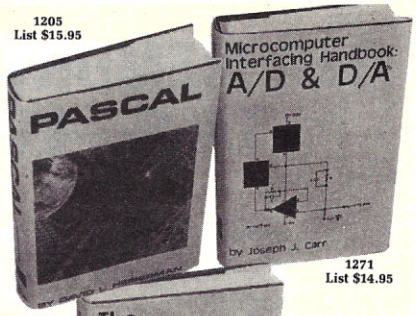
MAXELL® OR Dysan CORPORATION
Some computerists pay less - but may not receive Shuggart® or IBM® approved disks.
8" SINGLE SIDE DOUBLE DENSITY.....Box of 10 for $60
8" DOUBLE SIDE DOUBLE DENSITY.....Box of 10 for $70
5¼" MINI.....Box of 10 for $50
DYSAN® DISKS
5¼" MINI.....Box of 5 for $25
(Specify - 8" Soft or Hard Sector/5" Soft or Hard Sector)
VISA master charge
C.O.D.- $1.00 Additional
Custom Electronics Inc.
238 EXCHANGE STREET
CHICOPEE, MA. 01013
413·592·4761 ✓141
established 1960 · closed mondays
APPLE TRS-80 IBM WANG ALTAIR DATA-GENERAL MATTEL CROMEMCO
ATARI TI/99·4 PET

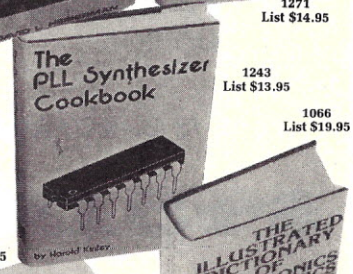
OHIO SCIENTIFIC SOFTWARE
COPY/1 CAN COPY A FULL DISK IN UNDER TWO MINUTES, USING A SINGLE DRIVE, FROM A COLD START.
No messing around with disk initializing or track zero set up or directory scan, these are all handled by COPY/1. COPY/1 needs 24k RAM; it can make 0 to 255 copies and can start and stop on any tracks. It lists the sector page count following each sector read or write action. It lists disk error type and location. All in full color with sound cues. (Also works fully without color or sound).
Cost $20 (plus 5% tax, Md. residents) includes disk and mailing.
From PRISM SOFTWARE Box 928 College Park, Md. 20740
✓204
Prism Software

ELECTRONICS BOOK CLUB



Take 6 great books for $2.95 (values to $98.70)







Into COMPUTERs?

Start saving now with discounts up to 75% on hundreds of info-packed volumes . . . PLUS special Members' Bonus Benefits!







More fine books to pick from . . .

- **The Most Popular Subroutines in BASIC.** List $9.95. **No. 1050**
- **Miniprocessors: From Calculators to Computers.** List $9.95. **No. 971**
- **How to Build Your Own Working Robot Pet.** List $10.95. **No. 1141**
- **A Beginner's Guide to Computers & Microprocessors.** List $10.95. **No. 1015**
- **57 Practical Programs & Games in BASIC.** List $10.95. **No. 1000**
- **Programming Microprocessors.** List $9.95. **No. 985**
- **Master Handbook of 1001 Practical Electronic Circuits.** List $15.95. **No. 800**
- **Troubleshooting Microprocessors and Digital Logic.** List $12.95. **No. 1183**





Join now, and get a *1981 Electronics Projects Calendar* **. . . FREE! (List $4.95)**

7 very good reasons to try Electronics Book Club . . .

- **Reduced Member Prices.** Save up to 75% on books sure to increase your know-how
- **Satisfaction Guaranteed.** All books returnable within 10 days without obligation
- **Club News Bulletins.** All about current selections—mains, alternates, extras—plus bonus offers. Comes 13 times a year with dozens of up-to-the-minute titles you can pick from
- **"Automatic Order".** Do *nothing*, and the Main selection will be shipped to you automatically! But . . . if you want an Alternate selection—or no books at all—we'll follow the instructions you give on the reply form provided with every News Bulletin
- **Continuing Benefits.** Get a Dividend Certificate with every book purchased after fulfilling Membership obligation, and qualify for discounts on many other volumes
- **Bonus Specials.** Take advantage of sales, events, and added-value promotions
- **Exceptional Quality.** All books are first-rate publisher's editions, filled with useful, up-to-the-minute info

ELECTRONICS BOOK CLUB
Blue Ridge Summit, PA 17214 ✓25

Please accept my Membership in Electronics Book Club and send the 6 volumes circled below, plus a free copy of *1981 Electronics Projects Calendar*. I understand the cost of the books selected is $2.95 (plus shipping/handling). If not satisfied, I may return the books within ten days without obligation and have my Membership cancelled. I agree to purchase 4 or more books at reduced Club prices during the next 12 months, and may resign any time thereafter.

800 971 985 1000 1015 1050 1062 1066
1070 1076 1085 1141 1142 1160 1169 1183
1187 1201 1203 1205 1241 1243 1271 1275

Name _____ Phone _____
Address _____
City _____
State _____ Zip _____

(Valid for new members only. Foreign and Canada add 15%.) MC-181

16K MEMORY KITS
TMS—4116 250 N.S.

FOR: APPLE, TRS-80, HEATH
EXPANDORAM I & II AND MANY MORE

12 MONTH GUARANTEE

$45.00 PER SET OF 8 CHIPS

ADD $2.00 SHIPPING & HANDLING PER ORDER

PAYMENT: MASTER CHARGE, VISA CASH, MONEY ORDER, U.P.S., C.O.D., PERSONAL CHECKS REQUIRE 2-3 WKS. TO CLEAR BANK.

✓80
Computer Services

30 Hwy. 321, N.W.
P. O. Box 2292
Hickory, N. C. 28601
(704) 294-1616

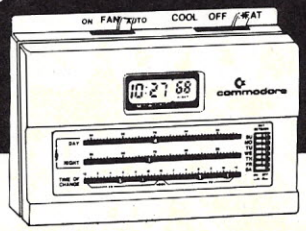
PHONE HOURS:

6 P.M. — 9 P.M. EST

Save money... Save energy

Cut your fuel bills with the new

commodore Programmable Thermostat



Easy to install ... in your present 24-volt heating/cooling system — in minutes — using only a screwdriver.

Easy to program ... for up to 4 temperature changes each day with dual set back feature.

Easy to operate ... with exclusive slide controls for both time and temperature.

Features continuous LCD read-out of time, temperature, day of week ... 7-day clock ... exclusive sliding lever controls ... "Day Skipper" switches ... complete instructions.

Commodore Thermostat—pays for itself in fuel savings in a year or less!

Get it today . . . start saving tomorrow

$129.95 includes shipping

marketed by:

✓142
Random Access, inc.

PO Box 1555 South Bend IN 46624
Order and Information Line
219-277-8844

RONDURE COMPANY

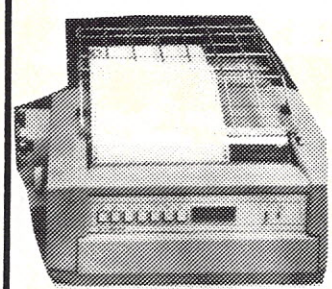
✓74

2522 BUTLER ST
DALLAS, TEXAS 75235
214—630-4621

the computer room

SPECIAL
Printer for your Microcomputer

GE TERMINET 300 PRINTER



Pin feed—9" paper

- 80 Print positions
- Receive only
- ASCII code
- RS-232 interface
- 30 CPS
- Upper & lowercase
- Shipping wt. 75#

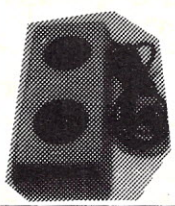
Shipping containers $15.00.

(used)

(good working condition)

Will run on serial RS232 port of most micros including TRS-80. **$450.00**

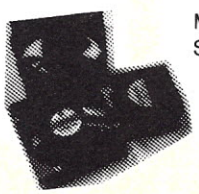
WE HAVE FLAT-PACK ACOUSTIC



Modem pickup

$19.50

USED FANS



Muffin — 8.00
Sprite — 4.00

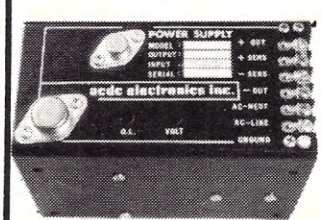
CDC POWER SUPPLY

13" x 6" x 6"—
+5 at 7 amp
+12 at .2 amp
−12 at 1.5 amp
+73 at .5 amp

$25.

RS 232 Cables Like New

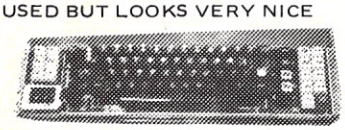
6' all pins wired male/female $25.00
8' RS 232 male/male $12.50
15' RS 232 male/male $20.00
25' RS 232 male/male $22.50
50' RS 232 male/male $45.00



NEW POWER SUPPLY
(AC-DC Brand)

Model 1-22V @ 1.9a $20.00
Model 2-15V @ 2.4a $30.00

MICRO SWITCH KEYBOARD
USED BUT LOOKS VERY NICE



ASC II **$40.00** (With Print)



USED OMNITEK

MODEM
ORIGINATE
ONLY
TESTED

$75.00 Sale

ORDERING INFORMATION:
We ship the same day we receive a certified check or money order. Texas residents add 5% sales tax. Send $1.00 for our CATALOG of many parts, terminals, printers, etc. (credit given on 1st order). All items subject to availability. Your money returned if we are out of stock. Mail order hours 9-4 Monday-Thursday. Closed Fridays.

SHIPPING INFORMATION:
Modems: $3.00 each; Key Boards $4.00, Power Supply $7.00.
Large Items & Parts: Specify Freight or Air Freight Collect.
Foreign Orders: Add appropriate freight or postage.
We now take Master Charge and Visa orders. Specify full number, bank number and expiration date.

Computer music synthesis in two parts.

Simulation Of Musical Instruments

By Hal Chamberlin

The use of microcomputers for teaching, composing, transcribing and playing music is rapidly becoming a major application area. New synthesizer boards, music programs, and integrated systems with music capability are among the new products highlighted in the microcomputer field. It is now common for university and even high school music departments to acquire a quantity of microcomputers solely for musical purposes. It is even getting to the point where it is hard to find a microcomputer owner *without* some kind of music program, even if it only plays kazoo-like music through a built-in two-inch speaker.

The Computer Music Field

Since any complete discussion of microcomputer music is impossible within the confines of a magazine format, this article deals with a much narrower subject area. First, however, we need to characterize the field somewhat to see how the topics of musical instrument simulation and software digital synthesis fit in.

Computer music systems cover a broad range of sophistication, application, capability, sound quality and cost. At one extreme, we have the limited-range, tinny, one-voice, "gee whiz" type of system mentioned earlier that can be set up for a dollar's worth of parts and a program whose listing would not even fill a page.

At the other extreme, we have experimental computer music systems in some universities that have a range beyond human perception, quadraphonic sound quality exceeding that of the best recording equipment, virtually unlimited synthesis capabilities and practically infinite voice count at a cost (if measured by industrial standards) in the millions. Using a microcomputer, you can set up a system with reasonably wide range, good stereo sound quality, good synthesis flexibility and 32 voices for a few thousand dollars. The important point is that there is a definite need for systems addressing these extremes and many points in between.

The simple one-voice systems are certainly the most common and are fully adequate for teaching elementary music concepts as well as for impressing friends and neighbors. In fact, they are probably preferred for getting started because their very simplicity makes them easy to learn and use. Since only pitch and timing can be controlled, there are only two variables to worry about. Harmony, timbre, envelope and dynamics are either absent or predetermined.

Note that this type of music system is easily implemented either purely in software using timed loops, which toggle an output port bit, or through a combination of software and hardware where control bytes are sent to a simple divide-by-N counter which may even be part of the I/O interface chip used by the computer. With this level of system, you either quickly outgrow it and move on or are content to file the program alongside the Lunar Lander and Star Trek cassettes.

The next step up is generally either a synthesizer board or an inexpensive eight-bit digital-to-analog converter. The synthesizer board is a set of several oscillators which at a minimum are programmable for pitch and amplitude. (There are a couple of very sophisticated single-voice synthesizer boards, but they are intended to be used in multiples.)

The simplest type of synthesizer board has three square-wave oscillators with pitch and amplitude registers for each and sometimes an overall volume control. Typically, these boards are implemented using programmable timer integrated circuits as the oscillators (normally intended for use in process-control-oriented microcomputers) and discrete circuitry for the volume control function.

Recently, General Instrument introduced a synthesizer chip that has

Hal Chamberlin is vice president of Research and Development for Micro Technology Unlimited, Box 12106, Raleigh, NC 27605. Active in electronic sound synthesis since 1966 and in computer music synthesis since 1970, he has authored numerous magazine articles and has recently published a book entitled Musical Applications of Microprocessors.

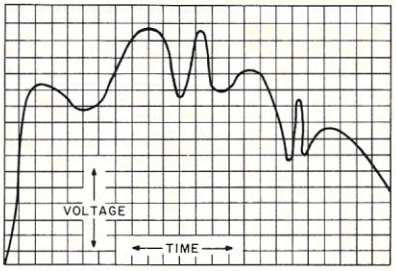


Fig. 1a. Desired audio waveform.

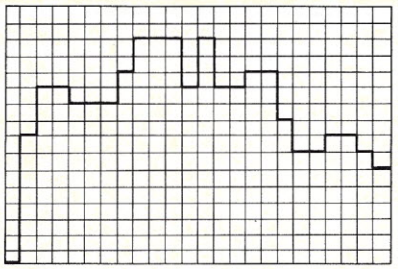


Fig. 1b. Raw DAC output.

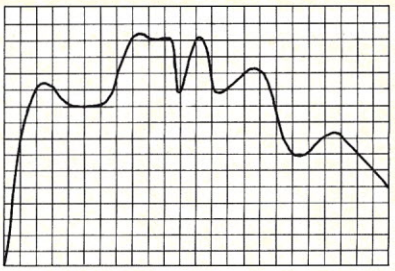


Fig. 1c. DAC output filtered by ideal low-pass filter.

the three oscillators *and* the volume control circuitry integrated on a single chip along with a noise generator useful for limited percussion effects. These chips, usually in trios for a total of nine voices, are appearing in the latest batch of synthesizer boards. Prices range from a little over $100 to nearly $300 with little connection between capability and price.

With these synthesizer boards, the computerist musician gains a great deal of flexibility, since he can play complex chords and control dynamics and tone envelopes. As a result, these boards are a great deal more difficult to master, although you can choose to ignore some of the variables initially.

There is one serious shortcoming, however: all synthesizer boards in this class produce square waves exclusively. (One three-voice board on the market has the capability of combining two of the voices into a single variable width rectangular wave, which increases the tonal variety somewhat.) Square waves have a rather sharp, yet hollow, sound that most closely resembles that of a kazoo. By suitable control of the amplitude envelope, you can produce continuous organ-like tones and percussive plucked-like tones, but the basic character of square waves remains.

With the proliferation of this type of board in recent months (and its constant demonstration at computer shows), the public may very well come to associate square wave sound with computers, just as a piano is associated with its own tone color. This would be unfortunate indeed, since the ultimate value added by computers in music is a wider range of timbres than any other instrument. Nevertheless, there is sufficient expressive power available so that the difference between a piece programmed by a novice and one programmed by an experienced musician is readily apparent.

Music systems based on these synthesizer boards seem to satisfy many users whose goal is to learn music, enjoy transcribing music into the computer and even perform simple composition. They typically will not satisfy a musician attempting to do serious performance work with the computer.

Much more sophisticated synthesizer boards with programmable waveforms are also available in the $500 to $2000 price range. These overcome the lack of tonal variety of the square wave boards by providing programmable waveforms, usually with provisions for a different waveform for each voice.

An important consideration that will be discussed later is whether the board allows dynamically variable waveforms; that is, the ability to smoothly alter the waveform while a note is being played with it. This is a requirement for many effects such as the "wah" of a muted trombone, and, as might be expected, the less expensive units do not provide for it. In either case, the tonal variety is far greater than the square wave units and is sufficient to satisfy many musicians as well as casual users.

On the other side of the hardware/software fence are music systems based on digital-to-analog converters (DAC). As we shall see later, a digital-to-analog converter simply translates numbers into voltages. A very rapid string of numbers produces a rapidly varying voltage; that is, an audio waveform.

In theory, appropriate software can calculate the necessary number sequence to produce literally any sound. The capabilities of a music system based on a digital-to-analog converter are determined solely by the sophistication of the software involved rather than the capabilities designed and frozen into a hardware synthesizer. DAC boards also tend to be less expensive. A good eight-bit DAC board sells for less than $70, while an experimental homebrew unit can be put together for half the price of a movie ticket.

The remainder of Part 1 will describe how sound generation software works in a DAC-based system.

Numbers to Sound

The fundamental principle behind digital sound synthesis is that a string of numbers from a computer program may be converted into a high-fidelity audio signal. As you might expect, the rate at which the numbers are supplied and the precision of the numbers both determine the fidelity of the resulting sound. In synthesis applications, fidelity's usual definition, i.e., faithfulness to the original, does not apply, since there is no original. Instead, fidelity is used to refer to the frequency range that can be produced and the relative freedom from undesired noise and distortion.

Fig. 1 shows how a DAC can produce a smooth audio waveform from a string of numbers and the errors involved. The grid in the figures represents time in the horizontal direction and voltage in the vertical direction. Fig. 1a shows a greatly magnified drawing of a small portion of a typical audio waveform. Notice that it wiggles and curves through the figure without regard for the grid. In Fig. 1b we have the raw output of a DAC being fed the string of numbers representing the waveform in Fig. 1a.

Each vertical grid line represents the point in time that the DAC receives a new number; thus, it stands to reason that the DAC output can only change up or down at vertical grid lines. Each horizontal grid line represents a possible numerical value that the DAC can receive. For example, an eight-bit DAC can only accept 256 (2^8) different numbers, so the complete grid for such a DAC would have 256 horizontal grid lines. As a result, the DAC output can only dwell at a horizontal grid line. Needless to say, the smoothly curved waveform of

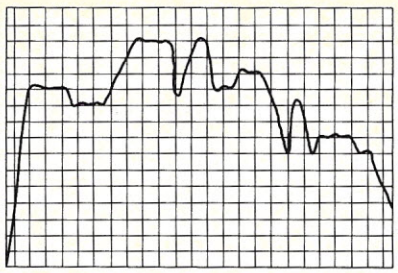


Fig. 1d. Filtered DAC output at twice the sample rate.

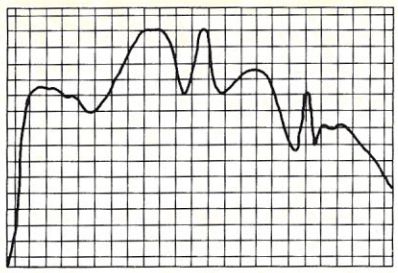
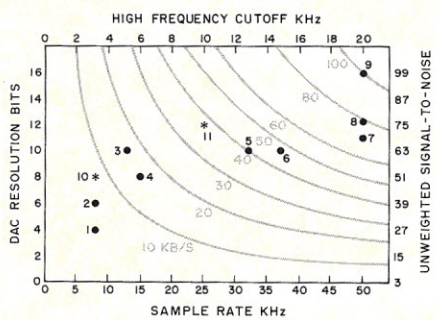


Fig. 1e. Filtered DAC output at twice the resolution and sample rate.

Fig. 1a is severely distorted in shape by this two-dimension quantization imposed by the DAC.

In Fig. 1c we have passed the raw DAC output through an ideal low-pass filter. Usually such a filter is described as allowing all frequencies below a certain cutoff frequency to pass through while blocking those above it. Here, however, we are using it to smooth the DAC output into something that more closely resembles Fig. 1a.

As you can see, the filter does a nice job of smoothing the curve between the vertical grid lines (that is, between new numbers from the computer). Closer examination, however, reveals that when the curve crosses a vertical grid line, it is also precisely on a horizontal grid line as well. Thus, since it is still constrained by the horizontal grid, there is still some error remaining. The only way to reduce this error is to make the horizontal grid lines denser by adding significant bits to the numbers and the DAC.



1. POOR LONG DISTANCE TELEPHONE
2. GOOD LONG DISTANCE TELEPHONE
3. GOOD A-M RADIO
4. $50 PORTABLE CASSETTE
5. $200 HI-FI CASSETTE
6. GOOD F-M RADIO
7. CONSUMER REEL-TO-REEL TAPE
8. PROFESSIONAL REEL-TO-REEL TAPE
9. PROFESSIONAL DIGITAL AUDIO
10. REAL-TIME MICROCOMPUTER DIGITAL SYNTHESIS
11. DELAYED PLAYBACK MICROCOMPUTER DIGITAL SYNTHESIS

Fig. 2. Required DAC resolution, sample rate and data required for varying degrees of fidelity.

Comparing Fig. 1c with Fig. 1d, it should be apparent that the horizontal spacing of vertical grid lines determines the shortest waveform wiggle that can be reproduced. Since the horizontal direction is time, this is the same as saying that the horizontal spacing limits the highest audio frequency that can be reproduced. In particular, it takes at least two grid lines to reproduce one cycle of a sine waveform, so it follows that the highest audio frequency must be equal to or less than one-half of the rate at which numbers are fed to the DAC. Actually, you can go this high only when an ideal low-pass filter is used to do the smoothing.

With a practical low-cost filter, audio frequencies should be kept to 40 percent or less of the DAC update, or sample rate. If higher frequencies are attempted, the filter cannot properly smooth the waveform and an unpleasant distortion called alias distortion occurs. Note that there is no low-frequency limit when producing sound with a DAC; you can go clear down to dc if desired.

No matter how dense the vertical grid lines become, the waveform accuracy is always constrained by the horizontal grid line spacing. This constraint leads to background noise and distortion that cannot be filtered out.

Fig. 1e illustrates the effect of adding another bit of precision to the DAC and the numbers it receives. In terms of audio noise level, adding the bit reduces noise by six decibels, a significant but not dramatic amount. In most cases the noise itself is basically white, resembling somewhat the sound of ocean surf.

Fig. 2 shows how the fidelity of various combinations of sample rate (horizontal grid spacing) and DAC resolution (vertical grid spacing) compares with familiar audio devices. Also shown are contours of constant data rate (total kilobytes per second) to give an idea of required system speed.

The important points are that frequency range and background noise level are independently adjustable system parameters and that greater fidelity is accompanied by a higher data rate. Note that it is considerably less expensive in terms of data rate to reduce the noise level than it is to increase the high-frequency limit. The two stars in Fig. 2 represent the two software digital music synthesis systems that will be discussed in this article.

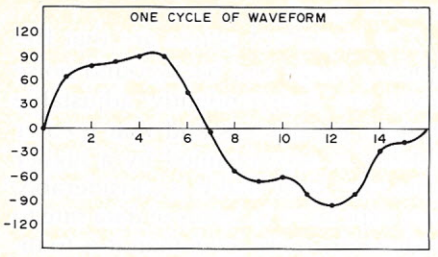
Where the Numbers Come From

The real trick in a DAC-based music system, then, is to compute the string of numbers, or samples, representing the desired sound and then send it to the DAC at the required rate. In all of the cases that will be considered here, the sample rate will be constant because that assumption greatly simplifies the computations. Conversely, when the rate is assumed to be constant, it must be to rather close tolerances to avoid excessive jitter noise.

At this point you can choose to go in either of two directions. In real-time digital synthesis, the samples are computed at the rate required by the DAC and sent to it immediately. The advantage, of course, is that the sound is heard in its final form as the program is running. The disadvantage is that practical sample rates are relatively high, which means that a very efficient program using an uncomplicated synthesis technique running on a fast microcomputer is required.

The other choice is delayed playback digital synthesis, where the computed samples are first written onto a mass storage device at relatively low speed and then later reread and played through the DAC at the necessary high speed. The advantages here are that the synthesis program can be more accurate (and thus slower), any synthesis technique of any complexity can be utilized, and the higher sample rates and DAC resolutions necessary for high fidelity can be utilized. The main disadvantages are a rather long delay between program execution and audible results and the need for a large capacity, high-speed mass storage system.

It is also possible to combine the two philosophies—real time for composition and experimentation with the orchestration and delayed playback for a high-fidelity final result.



WAVEFORM TABLE

ADDRESS	CONTENTS
0	0
1	67
2	79
3	81
4	92
5	93
6	46
7	-7
8	-55
9	-64
10	-60
11	-80
12	-93
13	-86
14	-27
15	-14

Fig. 3. Example waveform table.

The emphasis in this article will be on the real-time type of system, since that is of interest to most people at this time.

It should be noted that the software techniques that will be described actually perform the same functions as the hardware programmable waveform synthesizer boards mentioned earlier. In fact, a study of the history of computer music reveals that the techniques were developed first in software and then later implemented in hardware when it became practical to do so.

Let's begin by choosing a microprocessor, a sample rate and a DAC word size and then determine what can be done within those constraints.

The microprocessor will be a 6502 because of its usage in a large number of computers (PET, Apple II, Atari, KIM-1, SYM-1, AIM-65, OSI and Mattel, to name a few) and its effective high speed in this application (at a standard 1 MHz, approximately 60 percent faster than a 2 MHz 8080 or Z-80). About the lowest sample rate of interest is 8 kHz. This would allow audio frequencies up to a little beyond 3 kHz, which is just below the highest note on the piano keyboard. More important, it might limit the high harmonics of many instrumental sounds and thus give them a somewhat muffled character. Nevertheless, it is high enough to be useful.

Needless to say, the DAC word size will be eight bits because of the microprocessor chosen. This would give an audible but acceptably low background noise level with a DAC having true eight-bit linearity and a good low-pass filter.

Using the 8 kHz sample rate means that the time between samples is a mere 125 us, or around 40 machine-language instructions per sample. Clearly you cannot write the program in BASIC, use the SIN function to compute samples, use floating-point arithmetic or even perform a simple multiply operation and get a sound sample computed in 125 us, much less several for multi-part harmony. Although there are simple (and thus fast) methods of computing sawtooth, triangle and square wave samples directly, only three different waveforms would not be very much variety.

The answer is to compute the waveform ahead of time and put the results in a waveform table. The music playing program then merely looks up the waveform samples in the table—an operation that takes almost no time on a 6502—and sends them to the DAC. Since the waveform is precomputed, even a very slow BASIC program is acceptable for computing it.

A waveform table is nothing more than a string of bytes in memory where each byte is a sample along the stored waveform. For simplicity, which means speed, waveform tables will be made 256 bytes long, or one memory page. The 256-byte content of the waveform table represents exactly one cycle of the stored waveform. Fig. 3 aids in understanding the relation between a waveform and its image in the table. For illustration purposes the table length is assumed to be 16 bytes, but the same principles hold for the 256-byte length.

Now let's see how a music synthesis program might look up, or scan, the waveform table to produce sound. In its simplest form, scanning consists of reading the first entry, sending it to the DAC, reading the second entry, sending it to the DAC, etc., in a loop. When the end of the table is reached, it is necessary to wrap around to the beginning for the next cycle of the waveform.

If you did this at an 8 kHz rate with a 256 entry table, approximately 31 scans would be performed each second, which corresponds to 31 waveform cycles per second, a very low frequency note indeed. For higher frequency notes the scanning could be altered so that every other entry was read, which would give 62 Hz, every third for 93 Hz, etc. Although not intuitively obvious, skipping

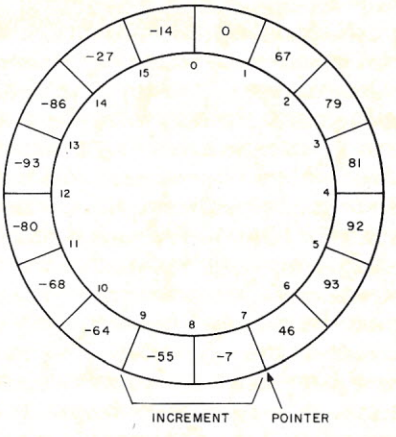
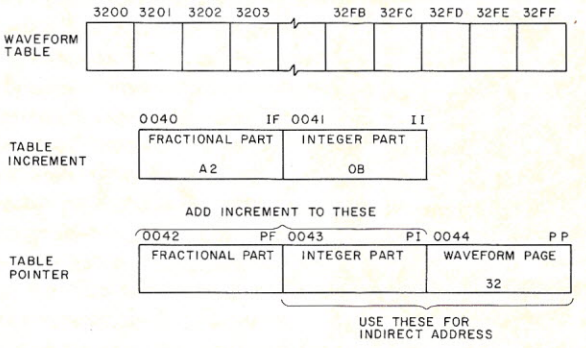


Fig. 4. Waveform table scanning.



ADDRESS	CODE	ASSEMBLY STATEMENT			EXECUTION TIME
0200	A5 42	LDA	PF	ADD FRACTIONAL PART OF INCREMENT TO FRACTIONAL PART OF POINTER	3
0202	65 40	ADC	IF		3
0204	85 42	STA	PF		3
0206	A5 43	LDA	PI	ADD INTEGER PART OF INCREMENT TO INTEGER PART OF POINTER WITH CARRY	3
0208	65 41	ADC	II		3
020A	85 42	STA	PI		3
020C	B1 43	LDA	(PI),Y	DO THE TABLE LOOKUP REGISTER Y=0, A HAS TABLE ENTRY WHEN DONE	5
					23

Fig. 5. Table scanning on the 6502.

waveform table entries does not contribute to distortion if the tabulated waveform conforms to certain rules that will be discussed later.

Fig. 4 aids in understanding the scanning process. Here the example 16-point waveform table has been bent into a circle, which is one way to view the wrap-around process mentioned earlier. The arrow represents the waveform table pointer, which contains the contents of a machine register or memory location. The bracket represents the value of the waveform table increment, which indicates how far the table pointer is advanced every 125 us sample period.

Thus, if the increment is one, the pointer will take on values of 0, 1, 2, . . . , 14, 15, 0, . . . (0–255 in real life) and give us a low note. If the increment is 3, the pointer will go through the sequence 0, 3, 6, 9, 12, 15, 2, . . . and give us a three-times-higher note. Thus, the increment is proportional to the pitch of the synthesized tone. Note that in this case successive trips around the table are not exactly the same. Again, this does not lead to distortion if the waveform meets certain requirements.

Returning to the real case of a 256 point table, it is apparent that the frequency resolution of 31 Hz when using integral waveform table increments is not sufficient for most musical applications. What is needed is the ability to specify an increment with a fractional part such as 7.04 to produce a precise A below middle C. This is quite possible but requires that the waveform pointer also take on a fractional part, which leads to a problem. How should the table be read when the pointer says "read the 78.645th entry"?

A sensible answer would be to look at both the 78th and 79th entries and then interpolate between them. Unfortunately, even simple linear interpolation is fairly complex (requires a multiply), which means it is slow. For real-time digital synthesis on a microcomputer, we will be forced to ignore the fractional part of the pointer when reading the table but include it when adding the increment to compute the next value of the pointer. Taking this shortcut leads to a distortion called interpolation noise, which is significant but generally tolerable.

Now how might a program segment be set up to manipulate the pointer, increment and table to generate sample values for the DAC? Fig. 5 shows the arrangement of a waveform table, its pointer and its increment in memory. For illustration purposes, the waveform table is assumed to be in memory from 3200–32FF, which is page 32, while the pointer and increment are kept in memory page zero for fast access. The increment is a two-byte value with an integer byte and fraction byte as mentioned above. The decimal equivalent of the increment value shown is 11.633. The pointer is actually a three-byte value.

The most significant byte is the page number (32) of the waveform table and normally remains constant but can be changed to select a different waveform. The middle byte is the integer byte of the pointer into that table, while the least significant byte is the fractional part of the pointer.

Every sample period (125 us) the increment is double-precision added to the integer and fractional parts of the pointer, and the pointer is replaced with the result. Any overflow is simply ignored, since it is merely an indication of wrap-around from the end to the beginning of the waveform table. Actual table lookup is extremely simple in the 6502; you simply use the rightmost two bytes of the pointer (the waveform table page address and the integer part of the pointer) as the indirect address of an indirect load instruction. Thus, only one instruction is needed to look up in the waveform table. The 6502 machine-language code shown requires only 23 us to do all of this.

Since the 23 us figure is considerably less than the 125 us allowable, you can have several waveforms, pointers and increments for several simultaneous tones. There is enough time to handle four tones with some left over for housekeeping. You could also have fewer voices and a higher sample rate, or more and a lower rate.

There are two ways to combine the

```
A00F            DAC     =       X'A00F          ; OUTPUT PORT ADDRESS WITH DAC
3000            WAV1TB  =       X'3000          ; WAVEFORM TABLE FOR VOICE 1
3100            WAV2TB  =       X'3100          ; WAVEFORM TABLE FOR VOICE 1
3200            WAV3TB  =       X'3200          ; WAVEFORM TABLE FOR VOICE 1
3300            WAV4TB  =       X'3300          ; WAVEFORM TABLE FOR VOICE 1

0000                    .=      0               ; STORAGE STARTS AT PAGE 0 LOCATION 0

0000 00         V1PT:   .BYTE   0               ; VOICE 1 WAVE POINTER, FRACTIONAL PART
0001 00                 .BYTE   0               ; INTEGER PART
0002 30                 .BYTE   WAV1TB/256      ; WAVEFORM TABLE PAGE ADDRESS FOR VOICE 1
0003 00         V2PT:   .BYTE   0               ; SAME AS ABOVE FOR VOICE 2
0004 00                 .BYTE   0
0005 31                 .BYTE   WAV2TB/256
0006 00         V3PT:   .BYTE   0               ; SAME AS ABOVE FOR VOICE 3
0007 00                 .BYTE   0               ;
0008 32                 .BYTE   WAV3TB/256
0009 00         V4PT:   .BYTE   0               ; SAME AS ABOVE FOR VOICE 4
000A 00                 .BYTE   0
000B 33                 .BYTE   WAV4TB/256

000C 0000       V1IN:   .WORD   0               ; VOICE 1 INCREMENT (FREQUENCY PARAMETER)
000E 0000       V2IN:   .WORD   0               ; VOICE 2
0010 0000       V3IN:   .WORD   0               ; VOICE 3
0012 0000       V4IN:   .WORD   0               ; VOICE 4

0014 00         DUR:    .BYTE   0               ; DURATION COUNTER
0015 B6         TEMPO:  .BYTE   182             ; TEMPO CONTROL VALUE, TYPICAL VALUE FOR
                                                ; 4:4 TIME, 60 BEATS PER MINUTE, DURATION
                                                ; BYTE = 48 (10) DESIGNATES A QUARTER NOTE

                ;       4 VOICE PLAY SUBROUTINE
                ;       ENTER WITH VARIOUS TABLE POINTERS ALREADY SET UP
                ;       LOOPS TEMPO*DUR TIMES
0300                    .=      X'0300
0300 A000       PLAY:   LDY     #0              ; SET Y TO ZERO FOR STRAIGHT INDIRECT
0302 A615               LDX     TEMPO           ; SET X TO TEMPO COUNT
                                                ; COMPUTE AND OUTPUT A COMPOSITE SAMPLE
0304 18         PLAY1:  CLC                     ; CLEAR CARRY
0305 B101               LDA     (V1PT+1),Y      ; ADD UP 4 VOICE SAMPLES
0307 7104               ADC     (V2PT+1),Y      ; USING INDIRECT ADDRESSING THROUGH VOICE
0309 7107               ADC     (V3PT+1),Y      ; POINTERS INTO WAVEFORM TABLES
030B 710A               ADC     (V4PT+1),Y      ; STRAIGHT INDIRECT WHEN Y INDEX = 0
030D 8D0FA0             STA     DAC             ; SEND SUM TO DIGITAL-TO-ANALOG CONVERTER
0310 A500               LDA     V1PT            ; ADD INCREMENTS TO POINTERS FOR
0312 650C               ADC     V1IN            ; THE 4 VOICES
0314 8500               STA     V1PT            ; FIRST FRACTIONAL PART
0316 A501               LDA     V1PT+1
0318 650D               ADC     V1IN+1
031A 8501               STA     V1PT+1          ; THEN INTEGER PART
031C A503               LDA     V2PT            ; VOICE 2
```

Listing 1. Core sound generation routine for organ-like music.

four table-lookup values into a single eight-bit value for the DAC. One is to simply add them up and send the sum to the DAC, which is the equivalent of audio mixing. When this is done the waveform table values must have been adjusted when the table was computed to avoid overflow (which can lead to horrendous distortion) when the four voices are added up.

The other method is to immediately send each value to the DAC when it is found and let the low-pass filter smear them together, thus effecting mixing. One disadvantage of this approach is that the dwell time of each voice in the DAC must be the same or there will be differences in loudness among the voices. Another disadvantage is that certain DAC distortions are accentuated, although they are usually not significant at the eight-bit level. It is also a simple matter to have two DACs and direct two voices to each for an approximation to stereo.

Listing 1 shows the core sound generation routine used in a digital synthesis program first published in 1977. It is capable of generating four tones simultaneously, where each tone can use a different waveform table. It uses the "add-em-up" technique of mixing the four voices into a single sample value for the DAC. A separate routine is expected to store the appropriate values in each of the four increments for the desired pitches and also set TEMPO and DUR for the desired duration of the chord.

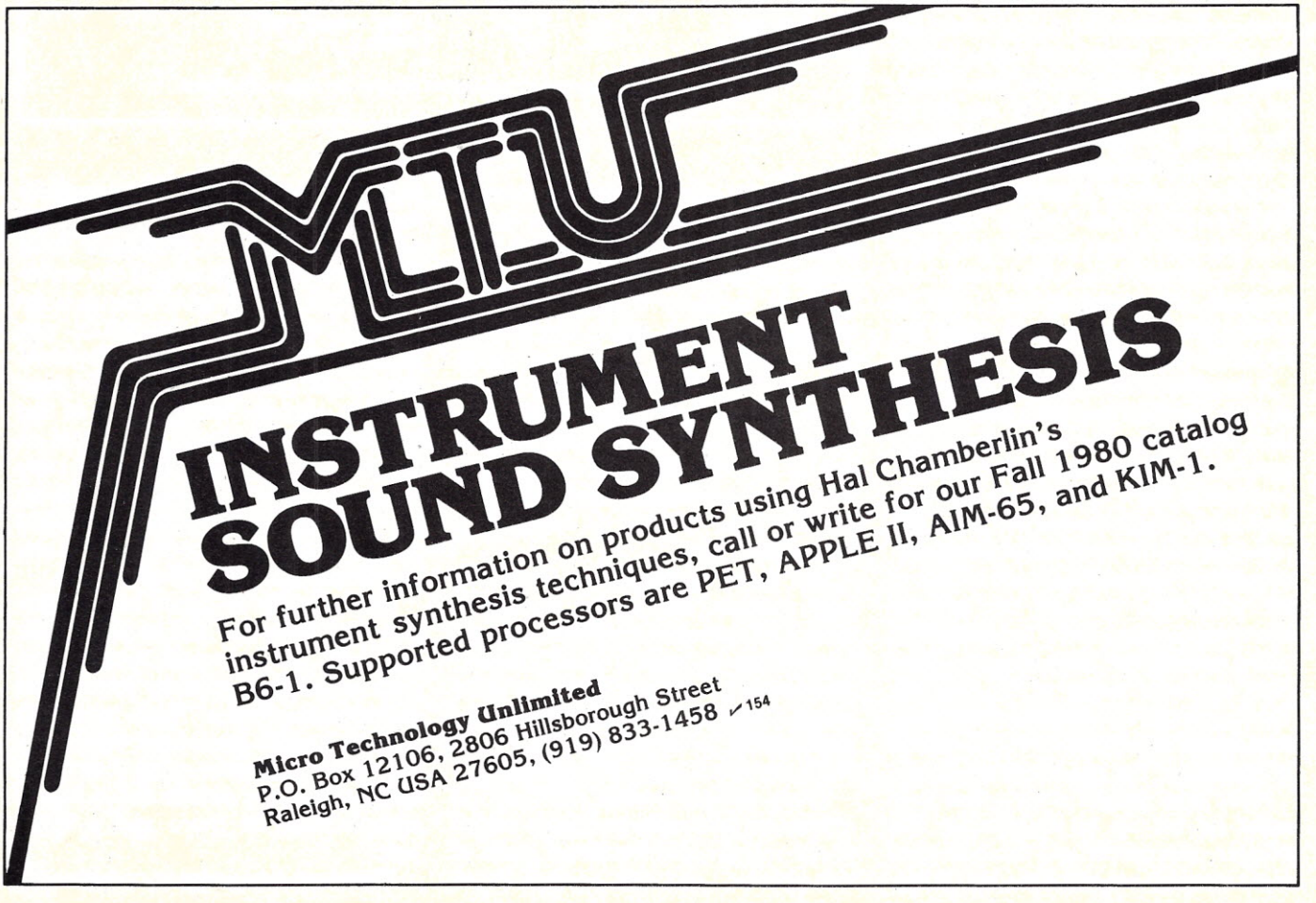
Each time through the main loop takes 115 us and represents one sample period, thus the sample rate is 8.7 kHz. Also, each time through the loop decrements a copy of TEMPO, which is held in the X register. When X decrements to zero, it is restored from TEMPO, and DUR is decremented directly in memory. If DUR also decrements to zero, the chord is complete and a return to the setup routine is taken. Thus, the total chord duration is proportional to the product of TEMPO and DUR. This property makes it possible to change the speed of the music without recoding it.

Note the presence of time-equalizing instructions at TIMWAS so that the loop time is the same whether or not register X decrements to zero. This is necessary to eliminate jitter distortion mentioned earlier.

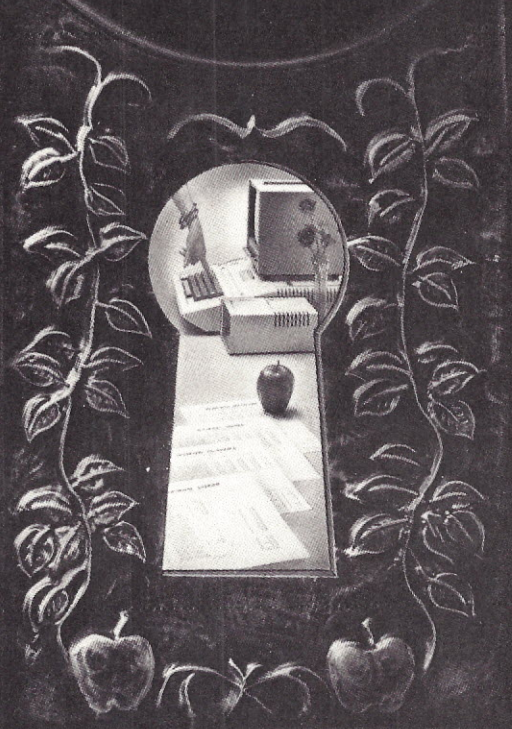
The setup routine would look at coded music in memory to determine what successive values of the four increments, DUR and possibly TEMPO should be to produce the desired music. Typically, music data would be set up in memory as a set of five bytes for each musical "event" (note or chord) in the piece. The first byte would be the duration, while the other four would represent the desired pitch of each of the four voices.

A note frequency table would be used to determine the proper two-byte value of the increment from the one-byte pitch code. This routine must also be as fast as possible because sound generation is stopped when it is in control. If the flow of samples is stopped for too long, an objectionable click between notes is introduced. See references for a further explanation of the setup routine.

Next month we will continue our discussion of synthesizing multiple tones using waveform table data, explore the capabilities of existing DAC software and examine some of the prospects for the future.■



It's Almost Obscene...



The tricks our IBMS software can make your Apple* do!

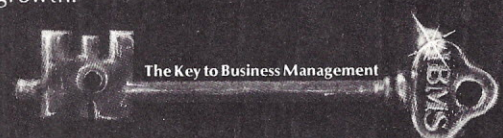
The small businessman has never had it so good, or so easy. Because now there's our **Interactive Business Management System** (IBMS) . . . which lets your micro-computer perform like a larger unit, so you can mind, monitor and manage every aspect of your business accounting.

A Full System
While it's extremely easy to use, IBMS is a full system to handle the full job. The ten program modules can generate everything from the original invoice to the final profit/loss statements, plus many peripheral operations. The special Menu includes: System Start-up. Accounts Receivable. Accounts Payable. Perpetual Inventory. Payroll. Fixed Assets. General Ledger. Plus Mailing Labels, and an Appointments Calendar.

Save Maximum Time
Since IBMS is a totally interactive system, multiple-entering of data is eliminated. Make an entry in one area and it automatically updates all concerned areas! No duplication of effort, no wasted time, no problems.

Proven. And then some.
It took 3 years to develop IBMS, including shake-down and on-site testing. As a result, it's reliable and versatile and its documentation is thorough and easily understandable. No wonder we consider it 5 years ahead of anything else available to the Apple II user.

Introductory Offer
The complete IBMS software package, on mini-floppy disks, documentation, and the backing of Programma International, Inc. is offered for a limited time at the **Introductory Price of $1495.00.** You'll be amazed how it can satisfy you . . . by saving you time, effort, money and employee growth.



PROGRAMMA
PROGRAMMA INTERNATIONAL, INC.
2908 N. Naomi Street, Burbank, Ca 91504
(213) 954-0240
* Apple is a trademark of Apple Computer, Inc.

✓ 103

Last month in Part 1 we examined the hardware requirements of the SN76489A sound chip. Let's now look at the software, with listings for the 8080/Z-80.

Computer Music The Easy Way

By Steve Marum

```
0000                    10 ******
0000                    20 *  THIS SUBROUTINE TAKES DATA FROM RAM AND SENDS
0000                    30 *  IT TO THE 76489 CHIP ADRESSED AT 0E800H.
0000                    40 *  CALL IT AT 0A000H (40960 DECIMAL).
0000                    50 *
0000                    60 *  DATA STARTING AT 'DATATABLE' IS SENT TO THE 76489
0000                    70 *  UNTIL A BYTE CONTAINING 01XXXXXX IS ENCOUNTERED
0000                    80 *  IF XXXXXX IS ZERO, THE PROGRAM 'RETURNS'.
0000                    90 *  IF XXXXXX IS NON-ZERO, THE PROGRAM PAUSES FOR
0000                   100 *  XXXXXX UNIT DELAYS, THEN CONTINUES SENDING DATA.
0000                   110 *  THE LENGTH OF THE UNIT DELAY IN MILLISEC. SHOULD
0000                   120 *  BE PLACED IN DE BEFORE CALLING, AND MUST BE <256
0000                   130 ******
0000                   140         ORG 0A000H
A000                   150 DELAY1MS EQU 166
A000                   160 DELAY30US EQU 20
A000                   170 PVE EQU 0E800H
A000 21 3B A0          180 PLAYSONG LD HL,DATATABLE
A003 23                190 GETNEXT INC HL
A004 7E                200         LD A,(HL)  GET NEXT BYTE
A005 47                210         LD B,A
A006 E6 C0             220         AND 0C0H
A008 FE 40             230         CP 040H
A00A CA 1A A0          240         JP Z,WAIT  STOP READING IF 01XXXXXX
A00D 78                250         LD A,B
A00E 32 00 E8          260         LD (PVE),A  SEND DATA TO PVE
A011 06 14             270         LD B,DELAY30US
A013 05                280 LOOP1 DEC B
A014 C2 13 A0          290       JP NZ,LOOP1
A017 C3 03 A0          300       JP GETNEXT
A01A 78                310 WAIT LD A,B
A01B FE 40             320      CP 040H  RETURN IF 40H
A01D C8                330      RET Z
A01E E6 3F             340      AND 03FH
A020 32 3B A0          350 LOOP2 LD (COUNTER),A NO. OF MIN. NOTES TO DELAY
A023 53                360       LD D,E  DELAY OF MIN. NOTE, IN MS.
A024 01 A6 00          370 LOOP3 LD BC,DELAY1MS  DELAY OF 1 MS.
A027 0B                380 LOOP4 DEC BC
A028 78                390       LD A,B
A029 B1                400       OR C
A02A C2 27 A0          410       JP NZ,LOOP4  GO BACK, MILLISECOND NOT OVER
A02D 15                420       DEC D
A02E C2 24 A0          430       JP NZ,LOOP3  GO BACK, MIN. NOTE NOT OVER
A031 3A 3B A0          440       LD A,(COUNTER)
A034 3D                450       DEC A
A035 C2 20 A0          460       JP NZ,LOOP2  GO DELAY MORE MIN. NOTES
A038 C3 03 A0          470       JP GETNEXT
A03B 00                480 COUNTER DEFB $-$
A03C                   490 DATATABLE EQU COUNTER  LOCATION IMM. AHEAD OF DATA
PROGRAM IS 60 BYTES LONG (1) WITH 0 ERRORS DETECTED.
> SYMBOL LISTING (Y=YES,N=NO)?
COUNTER=A03B DATATABLE=A03B DELAY1MS=00A6 DELAY30US=0014 GETNEXT=A003
LOOP1=A013 LOOP2=A020 LOOP3=A024 LOOP4=A027 PLAYSONG=A000 PVE=E800
WAIT=A01A
```

Listing 1. Machine-language program used with the EDIT2 BASIC program.

Last month I discussed the SN76489A computer-controlled sound chip from TI and how to attach it to an S-100-based machine. In this article, I'll cover the software necessary to produce good-sounding music.

Improving the Sound

The problem with the last two programs in part 1 was that BASIC was too slow to produce natural-sounding music. It takes two lines of program to change a frequency, which produces delays of ten milliseconds or more between notes. Although this doesn't sound that bad, it is noticeable when listening to the results. While you need to have a slight pause between consecutive notes of the same frequency so you can tell them apart, notes of differing frequencies sound better if they're run together.

A machine-language program would have no such problem. Data bytes can be sent to the 76489A chip

Steve Marum, 520 Talley, Sherman, TX 75090.

faster than it is capable of accepting them. This means all the registers on the 76489A can be changed in less than 200 microseconds.

One approach to this program—and the best from the user's point of view—is to write the complete software system in machine language. In addition to the play music routine, you must have an editor for entering the notes, a translator to convert the notes to codes suitable for the 76489A to digest and a few bookkeeping routines to load and save songs after they are keyed in. The net result is a quick-running program at the expense of much assembly-language coding.

A Compromise Approach

Not finding the performance of the BASIC program satisfactory and not being ready to tackle a complicated assembler program, I opted for a compromise between the two approaches. The entire program doesn't need to run fast to produce proper-sounding music. Only the routine that actually plays the music needs to run at full microprocessor speeds.

The translation of the music from music notation to 76489A-style codes can be done at a more leisurely pace if the results are stored for later playback. Thus, I have a BASIC program that contains the editor, translator and bookkeeping, plus a machine-language program that plays the translated music.

These two programs are shown in Listings 1 and 2. Listing 1 is the assembler program, using Zilog mnemonics on the XL-Z80 Software Development System, Version 2.1. Listing 2 is the BASIC program written in North Star BASIC Version 6, Revision 5, Release 4.0. Although Z-80 mnemonics are shown in Listing 1, I've used only the 8080 subset of op codes to facilitate transferring this routine to other computers.

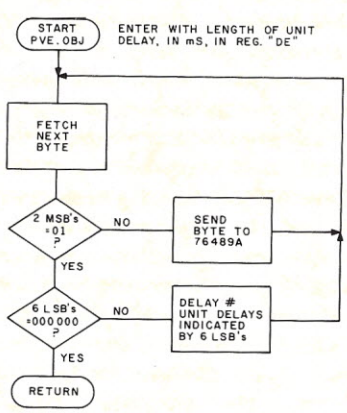


Fig. 1. Machine-language subroutine flowchart to drive SN76489A. To play music on the sound generator board, a simple machine-language program is used to rapidly update the registers on the sound IC between notes. This routine uses a table of data previously stored by a BASIC program, which did all of the complicated processing. All that's left to do is send the bytes to the music board and pause between notes to allow them to be heard.

The Assembly-Language Program

Fig. 1 shows a flowchart of the assembly-language program. As you can see, it's a simple program. It transfers bytes from memory to the 76489A circuit and pauses occasionally. The data to be sent to the 76489A must be loaded into the memory starting with the location immediately following COUNTER. From looking at the table of data formats used by the 76489A, you can see that in bytes beginning with 0 the second bit is a "don't care." I've left this bit a 0 in regular data bytes and set it to 1 when I want to flag this particular byte as a time delay value. When the machine-language program comes to a byte beginning with 01, the remaining bits are used to indicate the amount of time to waste.

You may have to change several bytes to use this program on other systems. The value of DELAY30US must be large enough so that the time it takes to get from GETNEXT back around the loop to GETNEXT again is greater than the pulse width in one-shot Z59. The value of DELAY1MS is chosen so LOOP4 takes one millisecond to count it down. PVE must point to the address of the 76489A. If you relocate the routine, all the absolute addresses must be adjusted accordingly.

The BASIC Program

Listing 2 is the BASIC program that edits and translates the music into byte-sized pieces for the 76489A. It is written in a somewhat structured for-

Listing 2. EDIT2, the North Star BASIC program that translates from music notation to codes suitable for the music generating board.

```
10 REM  3-VOICE MUSIC EDITOR/TRANSLATOR  7-26-79
15 REM  THIS PROGRAM PREPARES CODE FOR AN SN76489 HAVING A 2MHz CLOCK
20 DIM N$(6060),I$(6),T(14),F$(10),C1$(28),C2$(28),B$(60),W(6),L(3)
21 DIM N1$(3),T1(3),V(3),O(3)
200 REM  *** INITIALIZE ***
205 REM  SET LOOKUP TABLES
210 FOR J=1 TO 14\READ T(J)\NEXT J
215 DATA 1012,956,902,851,804,758,716,676,638,602,568,536,506,478
225 C1$="CbC C#D D#E F F#G G#A A#B B#"
230 C2$="CbC DbD EbE F GbG AbA BbB B#"
235 REM  CLEAR NOTE ARRAY
240 B$=""\FOR J=1 TO 60\B$=B$+CHR$(0)\NEXT J
245 FOR J=60 TO 6060 STEP 60\N$(J-59,J)=B$\NEXT J
250 REM  SET DEFAULT VALUES
255 P=1\S=50\N=59392\F1=0\F2=1\F3=0\P2=40960
260 FILL N,159\FILL N,191\FILL N,223\FILL N,255\REM TURN OFF PVE

1000 REM  *** INPUT COMMAND FROM TERMINAL ***
1010 INPUT "Command:  ",I$
1020 IF I$="PLAY" THEN 2000
1030 IF I$="REPLAY" THEN 3000
1040 IF I$="TEMPO" THEN 4000
1050 IF I$="GOTO" THEN 5000
1060 IF I$="INPUT" THEN 6000
1070 IF I$="INSERT" THEN 7000
1080 IF I$="DELETE" THEN 8000
1090 IF I$="CLEAR" THEN 9000
1100 IF I$="SAVE" THEN 10000
1110 IF I$="LOAD" THEN 11000
1120 IF I$="LIST" THEN 12000
1130 IF I$="FSAVE" THEN 13000
1140 IF I$="FLOAD" THEN 14000
1150 PRINT "Unrecognizable command, Try another ",\GOTO 1010

2000 REM  *** TRANSLATE SONG, THEN PLAY IT ***
2015 V(1)=15\V(2)=15\V(3)=15\REM ALL TG'S OFF
2018 O(1)=0\O(2)=0\O(3)=0\REM ALL TG'S OFF
2020 L(1)=-99\L(2)=-99\L(3)=-99\REM ALL TG'S UNUSED
2025 P1=41020\REM 1ST BYTE OF DATATABLE
2030 FOR J=6 TO 6000 STEP 6
2035 FOR K=1 TO 6\W(K)=ASC(N$(J-6+K,J-6+K))\NEXT K
2040 IF W(1)<>255 THEN 2050
2045 S=W(2)\GOTO 2280\REM SET TEMPO
2050 FOR K=1 TO 3
2055 IF W(2*K-1)=0 AND L(K)<>0 THEN 2155
2056 IF W(2*K-1)>0 THEN 2060
2057 L(K)=-99\FILL P1,112+32*K+15\P1=P1+1\GOTO 2155
2060 IF W(2*K-1)<>128 THEN 2085
2065 V(K)=W(2*K)
2070 IF L(K)<0 THEN 2080
2075 FILL P1,112+32*K+V(K)\P1=P1+1
2080 GOTO 2155
2085 IF W(2*K-1)<>48 THEN 2089
2086 FILL P1,112+32*K+15\P1=P1+1\O(K)=0\GOTO 2145
2089 IF L(K)>=0 AND O(K)=1 THEN 2095
2090 FILL P1,112+32*K+V(K)\P1=P1+1\O(K)=1
2095 K1=INT(W(2*K-1)/16)\K2=W(2*K-1)-16*K1
```

More

Listing 2 continued.

```
2100 K3=T(K2)
2105 IF K1=2 THEN K3=K3/2
2110 IF K1=3 THEN K3=K3/4
2115 IF K1=4 THEN K3=K3/8
2120 IF K1=5 THEN K3=K3/16
2125 K3=INT(K3+.5)
2130 K4=INT(K3/16)\K5=K3-16*K4\REM K4=6 MSB S, K5=4 LSB S
2135 FILL P1,96+32*K+K5\P1=P1+1
2140 FILL P1,K4\P1=P1+1
2141 N1$(K,K)=CHR$(W(2*K-1))
2145 L(K)=W(2*K)
2146 IF L(K)>127 THEN T1(K)=1 ELSE T1(K)=0
2150 IF L(K)>127 THEN L(K)=L(K)-128
2155 NEXT K
2160 K1=99\FOR K=1 TO 3\REM START OF `COUNTDOWN´
2165 IF L(K)>0 AND L(K)<K1 THEN K1=L(K)\NEXT K
2170 FOR K=1 TO 3\L(K)=L(K)-K1\NEXT K
2175 FOR K=1 TO 3\IF L(K)>0 THEN EXIT 2180\NEXT K\GOTO 2220
2180 FOR K=1 TO 3\K2=ASC(N$(J-1+2*K,J-1+2*K))
2185 IF L(K)>0 AND K2>0 AND K2<128 THEN EXIT 2195\NEXT K

2190 GOTO 2220
2195 FILL P1,64+K1\P1=P1+1
2200 FOR K=1 TO 3\IF L(K)<>0 THEN 2210
2205 L(K)=-99\FILL P1,112+32*K+15\P1=P1+1
2210 NEXT K\GOTO 2160
2215 REM LOOK FOR CONSECUTIVE NOTES
2220 FOR K=1 TO 3\IF L(K)>0 OR ASC(N$(J-1+2*K,J-1+2*K))>0 THEN EXIT 2230
2225 NEXT K\GOTO 2285
2230 K3=0\FOR K=1 TO 3
2235 IF N$(J-1+2*K,J-1+2*K)<>N1$(K,K) THEN 2245
2240 IF L(K)=0 AND T1(K)=0 THEN K3=1
2245 NEXT K\IF K3>0 THEN 2260
2250 FILL P1,64+K1\P1=P1+1\IF P1<49000 THEN 2280
2255 PRINT "Song too long."\FILL P1,64\F1=1\EXIT 1010
2260 FILL P1,64+K1-1\P1=P1+1
2265 FOR K=1 TO 3\IF L(K)<>0 OR T1(K)=1 THEN 2275
2270 IF N$(J-1+2*K,J-1+2*K)<>N1$(K,K) THEN 2275
2272 L(K)=-99\FILL P1,112+32*K+15\P1=P1+1
2275 NEXT K\FILL P1,65\P1=P1+1\IF P1>49000 THEN 2255
2280 NEXT J
2285 FILL P1,64+K1\P1=P1+1\FILL P1,64\F1=1
2290 K4=CALL(P2,S)\FILL N,159\FILL N,191
2295 FILL N,223\FILL N,255\GOTO 1010

3000 REM  *** REPLAY A SONG ALREADY TRANSLATED ***
3015 IF F1=1 THEN 3030
3020 PRINT "You must `PLAY´ the song before you `REPLAY´ it."
3025 GOTO 1010
3030 J=CALL(P2,S)\FILL N,159\FILL N,191\FILL N,223\FILL N,255
3035 GOTO 1010

4000 REM  *** SET THE TEMPO ***
4015 PRINT "Old tempo (quarter notes per minute) was",5000/S
4020 INPUT "Enter new tempo:  ",J
4025 IF J>50 AND J<500 THEN 4035
4030 PRINT "That s not realistic!  ",\GOTO 4020
4035 S=INT(5000/J+.5)\GOTO 1010

5000 REM  *** PUT NEW ADDRESS INTO P ***
5015 PRINT "Program Counter presently points to",P
5020 INPUT "Enter new value:  ",J
5025 IF J>=1 AND J<1000 THEN 5035
5030 PRINT "That's out of bounds.  ",\GOTO 5020
5035 P=INT(J)\GOTO 1010

6000 REM  *** INPUT NOTES TO MEMORY ***
6015 GOSUB 6200
6020 IF F4=1 THEN 1010
6025 FOR J=1 TO 6\N$(6*P-6+J,6*P-6+J)=CHR$(W(J))\NEXT J
6030 P=P+1\F2=0
6035 IF P<1000 THEN 6015
6040 P=P-1
6045 PRINT "End of memory reached."\GOTO 1010
6195 REM  *** SUBROUTINE TO READ 3 NOTES INTO `W´ ARRAY ***
6200 F4=0
6205 PRINT CHR$(12),"Location:  ",P
6210 FOR J=1 TO 3
6215 PRINT "Note",J,
6220 INPUT ":  ",I$
6225 IF LEN(I$)>0 THEN 6235
6230 W(2*J-1)=0\W(2*J)=0\GOTO 6505
6235 IF I$<>"END" THEN 6245
6240 F4=1\EXIT 6510
6245 IF I$(1,1)<>"T" THEN 6285
6250 IF J=1 THEN 6260
6255 PRINT "Tempo can only be changed during `Note 1 .´"\GOTO 6215
6260 INPUT "Enter tempo:  ",K
6265 IF K>50 AND K<500 THEN 6275
6270 PRINT "That s not realistic!  ",\GOTO 6260
6275 W(2)=INT(5000/K+.5)\W(1)=255\W(3)=0\W(4)=0\W(5)=0\W(6)=0
6280 EXIT 6510
6285 IF I$(1,1)<>"V" THEN 6315
6290 INPUT "Enter attenuation in dB (0 thru 30):  ",K
6295 IF K>=0 AND K<=30 THEN 6310
6300 PRINT "The attenuation must be between 0dB (full volume)",
6305 PRINT " and 30dB (off)."\GOTO 6290
6310 W(2*J)=INT(K/2+.5)\W(2*J-1)=128\GOTO 6505
6315 IF I$(1,1)<>"R" THEN 6325
6320 W(2*J-1)=48\GOTO 6440
6325 IF LEN(I$)=3 THEN 6345
6330 I$=I$+"N"
6335 IF LEN(I$)=3 THEN 6345
6340 PRINT "Invalid input.  Retype ",\GOTO 6215
6345 K1=0\K2=0\REM  K1=OCTAVE, K2=NOTE
6350 IF I$(1,1)="1" THEN K1=1
```

More

mat using the top-down approach. The "mainline" is just a short section that asks which function is to be performed. The actual processing of that function is done in a separate routine selected by the mainline. The print statements are written to use an SWTP CT-82 terminal. You may have to eliminate some of the control codes (such as form feed, 0C hex) if your terminal won't handle them.

Lines 10–260 initialize the arrays and lookup tables. After that, all four outputs of the 76489A are turned off. The 76489A can make some pretty raucous sounds when powering up; you may want to move this line closer to the beginning of the program. (Better yet, write an initialization routine that will turn off the 76489A every time your computer is turned on.)

Lines 1000–1150 look for a valid command to be typed in, then branch out to the proper section of code. Any new functions you may add can be handled by inserting more tests between lines 1010 and 1150. Writing the program in this manner greatly simplifies debugging.

Once you get to line 1150, you have a complete program that will run. You'll get an invalid line number error if you try to run one of the functions. However, after typing in two or three routines, you can execute the program and get them debugged before other, perhaps more complex, sections are written.

I started out with the GOTO, input, insert and delete routines and got them going before I went on. By the time I got to save and load, I already knew I could get valid data into the memory from sheet music. Then, assured that all my test data was safely on disk in case the program crashed (which it did—several times), I tackled the play routine. This is definitely the way to write a complex program.

Before going further, I should make a few comments on the general flow of the program. As music is typed in from the keyboard, it is partially translated and saved in a large string array a byte at a time. After the octave and note are entered, they are crunched into one byte. The duration, which is entered next, is also converted to a single byte. Thus, all the information necessary to specify three notes is contained in six bytes, and a string 6000 bytes long will hold 1000 notes. This is more than enough for most songs; the most I have used to date is about 650 notes.

It is important in multiple-voice

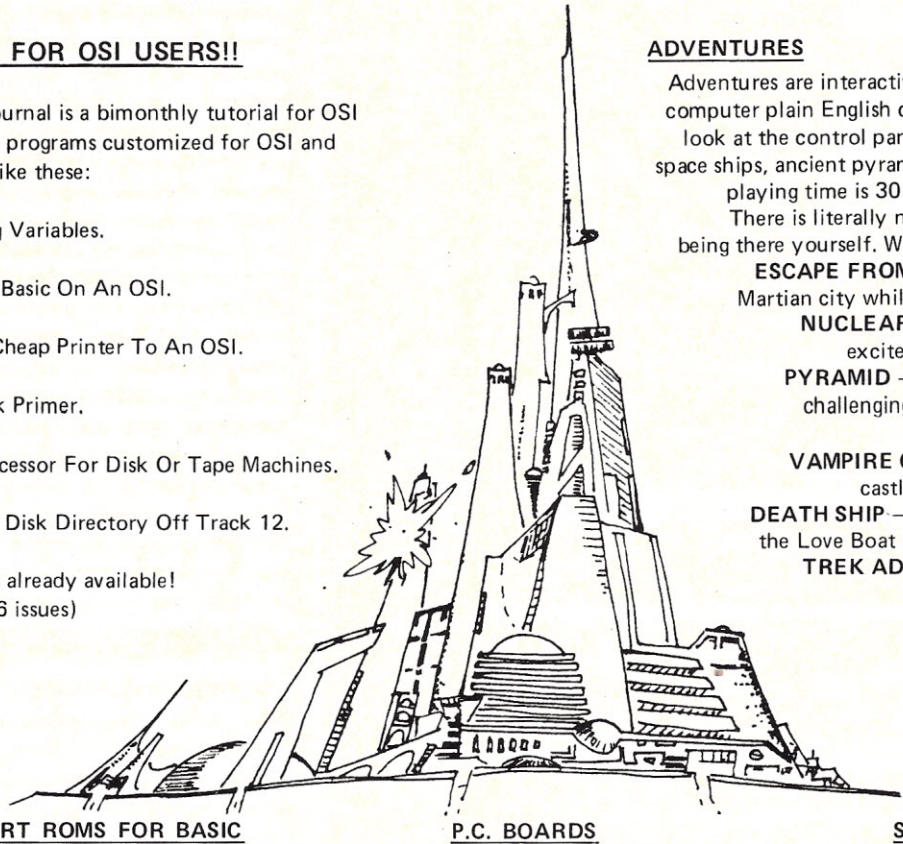
OSI SOFTWARE FOR OSI OSI

A JOURNAL FOR OSI USERS!!

The Aardvark Journal is a bimonthly tutorial for OSI users. It features programs customized for OSI and has run articles like these:

1) Using String Variables.
2) High Speed Basic On An OSI.
3) Hooking a Cheap Printer To An OSI.
4) An OSI Disk Primer.
5) A Word Processor For Disk Or Tape Machines.
6) Moving The Disk Directory Off Track 12.

Four back issues already available!
$9.00 per year (6 issues)



ADVENTURES

Adventures are interactive fantasies where you give the computer plain English commands (i.e. take the sword, look at the control panel.) as you explore alien cities, space ships, ancient pyramids and sunken subs. Average playing time is 30 to 40 hours in several sessions. There is literally nothing else like them – except being there yourself. We have six adventures available.

ESCAPE FROM MARS – Explore an ancient Martian city while you prepare for your escape.
NUCLEAR SUBMARINE – Fast moving excitement at the bottom of the sea.
PYRAMID – Our most advanced and most challenging adventure. Takes place in our own special ancient pyramid.
VAMPIRE CASTLE – A day in old Drac's castle. But it's getting dark outside.
DEATH SHIP – It's a cruise ship – but it ain't the Love Boat and survival is far from certain.
TREK ADVENTURE – Takes place on a familiar starship. Almost as good as being there.

$14.95 each

NEW SUPPORT ROMS FOR BASIC IN ROM MACHINES

C1S – for the C1P only, this ROM adds full screen edit functions (insert, delete, change characters in a basic line.), Software selectable scroll windows, two instant screen clears (scroll window only and full screen.), software choice of OSI or standard keyboard format, Bell support, 600 Baud cassette support, and a few other features. It plugs in in place of the OSI ROM. NOTE: this ROM also supports video conversions for 24, 32, 48, or 64 characters per line. All that and it sells for a mesly $39.95.
C1E/C2E for C1/C2/C4/C8 Basic in ROM machines.
This ROM adds full screen editing, software selectable scroll windows, keyboard correction (software selectable), and contains both an extended machine code monitor and a fix for the string handling bug in OSI Basic!! It has breakpoint utilities, machine code load and save, block memory move and hex dump utilities. A must for the machine code programmer replaces OSI support ROM. Specify system! $59.95
STRING BUG FIX (replaces basic ROM chip number 3)
All this chip does is to replace the third basic ROM and correct the errors that were put into the ROM mask. $19.95

DATA SHEETS

OS65D LISTING
Commented with source code, 83 pages. $24.95
THE (REAL) FIRST BOOK OF OSI
65 packed pages on how OSI basic works. Our best selling data sheet. $15.95
OSI BASIC IN ROM
Ed Carlson's book of how to program in basic. Now available from Aardvark. $8.95

P.C. BOARDS

MEMORY BOARDS!! – for the C1P. – and they contain parallel ports!
Aardvarks new memory board supports 8K of 2114's and has provision for a PIA to give a parallel ports! It sells as a bare board for $29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

REAL SOUND FOR THE C1P – and it's cheap! This bare board uses the TI sound chip to give real arcade type sound. The board goes together in a couple of hours with about $20.00 in parts. Bare board, plans, and sample program – $15.95

ARCADE AND VIDEO GAMES

ALIEN INVADERS with machine code moves – for fast action. This is our best invaders yet. The disk version is so fast that we had to add selectable speeds to make it playable.
Tape - $10.95 – Disk - $12.95

TIME TREK (8K) – real time Startrek action. See your torpedoes move across the screen! Real graphics – no more scrolling displays. $9.95

STARFIGHTER – a real time space war where you face cruisers, battleships and fighters using a variety of weapons. Your screen contains working instrumentation and a real time display of the alien ships. $6.95 in black and white - $7.95 in color and sound.

SEAWOLFE – this one looks like it just stepped out of the arcades. It features multiple torpedoes, several target ships, floating mines and real time time-to-go and score displays. – $6.95 in black and white $7.95 in color and sound.

SCREEN EDITORS

These programs all allow the editing of basic lines. All assume that you are using the standard OSI video display and polled keyboard.
C1P CURSOR CONTROL – A program that uses no RAM normally available to the system. (We hid it in unused space on page 2). It provides real backspace, insert, delete and replace functions and an optional instant screen clear.
$11.95
C2/4 CURSOR. This one uses 366 BYTES of RAM to provide a full screen editor. Edit and change lines on any part of the screen. (Basic in ROM systems only.)
FOR DISK SYSTEMS – (65D, polled keyboard and standard video only.)
SUPERDISK. Contains a basic text editor with functions similar to the above programs and also contains a renumberer, variable table maker, search and new BEXEC* programs. The BEXEC* provides a directory, create, delete, and change utilities on one track and is worth having by itself. – $24.95 on 5" disk - $26.95 on 8".

DISK UTILITIES

SUPER COPY – Single Disk Copier
This copy program makes multiple copies, copies track zero, and copies all the tracks that your memory can hold at one time – up to 12 tracks at a pass. It's almost as fast as dual disk copying. – $15.95
DISK CATALOGER
This utility reads the directory of your disks and makes up an alphabetic list off all your programs and what disks they are on. $14.95
MACHINE CODE RENUMBERER
(C2/4-MF only)
Renumbers all or part of a program at machine code speeds. – $15.95

VISA

This is only a partial listing of what we have to offer. We now offer over 100 programs, data sheets, ROMS, and boards for OSI systems. Our $1.00 catalog lists it all and contains free program listings and programming hints to boot.

master charge

✓91

OSI

Aardvark Technical Services • 1690 Bolton • Walled Lake, MI 48088
(313) 669-3110 or (313) 624-6316

OSI

✓ Reader Service—see page 226

Listing 2 continued.

```
6355 IF I$(1,1)="2" THEN K1=2
6360 IF I$(1,1)="3" THEN K1=3
6365 IF I$(1,1)="4" THEN K1=4
6370 IF I$(1,1)="5" THEN K1=5


6375 IF I$(2,2)="C" THEN K2=2
6380 IF I$(2,2)="D" THEN K2=4
6385 IF I$(2,2)="E" THEN K2=6
6390 IF I$(2,2)="F" THEN K2=7
6395 IF I$(2,2)="G" THEN K2=9
6400 IF I$(2,2)="A" THEN K2=11
6405 IF I$(2,2)="B" THEN K2=13
6410 IF K1=0 OR K2=0 THEN 6340
6415 IF I$(3,3)="S" THEN K2=K2+1
6420 IF I$(3,3)="#" THEN K2=K2+1
6425 IF I$(3,3)="B" THEN K2=K2-1
6430 IF I$(3,3)="b" THEN K2=K2-1
6435 W(2*J-1)=K1*16+K2
6440 REM  GET DURATION
6445 PRINT "Duration",J,
6450 INPUT ":  ",K
6451 IF K<0 THEN K5=128 ELSE K5=0
6452 K=ABS(K)
6455 K1=INT(K)\K2=K-K1
6460 K=48/K1
6465 IF K2=.5 THEN K=K*1.5
6470 IF K2=.3 THEN K=K*2/3
6475 K=INT(K)
6480 IF K>=1 AND K<=48 THEN 6495
6485 PRINT "That's outside the range of permissable values."
6490 PRINT "(Whole note thru sixteenth note) ",\GOTO 6445
6495 W(2*J)=K+K5
6505 NEXT J
6510 RETURN


7000 REM  *** INSERT NOTES TO MEMORY (PUSH FOLLOWING LOCATIONS UP) ***
7015 GOSUB 6200
7020 IF F4=1 THEN 1010
7025 K1=P-INT(P/10)*10
7030 FOR J=990+K1 TO P STEP -10
7035 B$=N$(J*6-5,J*6+54)
7040 N$(J*6+1,J*6+60)=B$
7045 NEXT J
7050 FOR J=1 TO 6\N$(6*P-6+J,6*P-6+J)=CHR$(W(J))
7052 N$(5994+J,5994+J)=CHR$(0)\NEXT J
7055 P=P+1\F2=0
7060 IF P<1000 THEN 7015
7065 P=P-1\PRINT "End of memory reached."\GOTO 1010


8000 REM  *** DELETE NOTES BEGINNING AT `P' ***
8015 PRINT "How many notes should be deleted, starting with note",P,
8020 INPUT ":  ",K
8025 IF P+K<=999 THEN 8035
8030 PRINT "That's too many.  There are only 999 notes."\GOTO 8015
8035 FOR J=P+K TO 999 STEP 10
8040 B$=N$(J*6-5,J*6+54)
8045 N$((J-K)*6-5,(J-K)*6+54)=B$
8050 NEXT J
8055 FOR J=5995-6*K TO 5994\N$(J,J)=CHR$(0)\NEXT J
8060 F2=0\GOTO 1010


9000 REM  *** CLEAR THE NOTE STORAGE ARRAY ***
9015 IF F2=1 THEN 9035
9020 PRINT "Are you sure you want to clear the memory (you haven't saved"
9025 INPUT "the present file since you last changed it)?  ",I$
9030 IF I$<>"YES" THEN 1010
9035 B$=""\FOR J=1 TO 60\B$=B$+CHR$(0)\NEXT J
9040 FOR J=60 TO 6060 STEP 60\N$(J-59,J)=B$\NEXT J
9045 P=1\GOTO 1010


10000 REM  *** SAVE SONG ON DISK ***
10015 INPUT "Which file would you like to use?  ",F$
10017 IF LEN(F$)=0 THEN 1010
10018 IF F$(1,1)<>"F" THEN 10020
10019 PRINT "Sorry, names cannot begin with `F'."\GOTO 1010
10020 K1=FILE(F$)
10025 IF K1>=0 THEN 10050
10030 INPUT "That file doesn't exist.  Shall I create it?  ",I$
10035 IF I$<>"YES" THEN 1010
10040 GOSUB 10300
10045 CREATE F$,K2\GOTO 10065
10050 IF K1=3 THEN 10060
10055 PRINT "Sorry, that's not a BASIC data file."\GOTO 1010
10060 GOSUB 10300
10065 OPEN #1,F$,K1
10070 IF K1>=K2 THEN 10080
10075 PRINT "Sorry, that file isn't large enough."\CLOSE #1\GOTO 1010
10080 WRITE #1,K3
10085 FOR J=1 TO K3\WRITE #1,N$(J*60-59,J*60)\NEXT J
10090 CLOSE #1
10095 F2=1\GOTO 1010
10300 REM  *** SUBROUTINE TO COMPUTE FILE SIZE REQUIRED
10305 REM  K2=# SECTORS, K3=# 10 NOTE BLOCKS
10310 FOR K3=1 TO 100
10315 IF N$(60*K3-5,60*K3-5)<>CHR$(0) THEN 10330
10320 IF N$(60*K3-3,60*K3-3)<>CHR$(0) THEN 10330
10325 IF N$(60*K3-1,60*K3-1)=CHR$(0) THEN EXIT 10335
10330 NEXT K3
10335 K2=INT((K3*62+6)/256)+1
10340 RETURN


11000 REM  *** LOAD A SONG FROM DISK ***
11015 IF F2=1 THEN 11035
```

More →

music generation that the notes do not stay synchronized in the short term. Over a long sequence, such as a measure, they do, but often a half note is combined with two quarter notes or a quarter note triplet. This means that as you type the music in, one location may contain a half note for tone generator 1 and a quarter note for tone generator 2. Then the following location will contain nothing for tone generator 1 and a different quarter note for tone generator 2.

This is because the half note being sounded by tone generator 1 is only 50 percent through when tone generator 2 comes to the end of its first quarter note and needs to look for another. In a different circumstance, a half note may be paired with a single quarter note, implying that the second tone generator should remain silent for the second half of the half note. The translating routine must be able to handle these situations.

Translating the Notes

Lines 2000–2295 contain the code that translates the notes and pokes the results into the data area used by the machine-language routine. This section is split into three major blocks.

The first block, lines 2000–2155, fetches a six-byte note triplet from the large string, converts each of the three frequencies to 76489A codes and pokes them to the machine-language routine data table. The frequency byte is used to access the "bottom octave" table via the four bits representing the desired note. Then the value from the table is divided by two the same number of times as the octave specified.

Remember—the 76489A requires a period as an input, not a frequency. Thus, dividing the period by two raises the frequency one octave. The duration of each note is saved for later analysis. If the code for a given tone generator is blank and the previous duration on this generator has expired, it is turned off. If this generator is in the middle of a note, the blank is ignored. If any durations are negative, a flag is set to indicate that this note is to be tied to the next one for this tone generator.

Block number two, line 2160–2210, finds the tone with the shortest duration. This value is subtracted from all three durations. If the next note triplet only contains values for notes that have timed out, the program jumps to block three. If the next note triplet

contains a value for a note that has not timed out yet, the value of the shortest duration is poked to the output table as a delay, and codes to turn off any tones that have timed out are also poked to the output table. Then block two is run again.

The third block, lines 2215–2295, checks for consecutive notes of the same frequency. If any note that has just ended is the same frequency as the corresponding note in the next triplet, a pause equal to a 1/48 note is inserted into the output table. However, if the previous duration was negative, indicating a tied note, the pause is not inserted. After this, return to block 1 to go around again on the next set of notes.

When a couple of all-blank-note triplets are encountered, the play translation routine assumes it has come to the end of the song and pokes a return code to the output table. The machine-language program to play the music is then called, passing the tempo to it as the only parameter. When the song has been played, the machine-language program returns to the BASIC program, which jumps back to the command input section at line 1000.

Replaying a Translated Song

The replay section comprises lines 3000–3035. After checking that the song has been translated, you call the machine-language routine. If the song has not yet been translated, an error message is printed and the command mode reentered.

Bookkeeping Routines

Lines 4000–4035 set the tempo. Since the tempo is usually given in quarter notes per minute, it is converted to the length of a 1/48 note and saved. The tempo can also be stored as part of a song, in which case playing the song will use the pre-stored tempo. However, you can change the tempo after the song is finished and replay it at the new tempo. The entire song must be played at the same tempo; you can't alter the tempo in the middle of a song. This would be a nice improvement for the future.

Lines 5000–5035 load a new address into the pointer used by the editor. Any inserting, inputting or deleting takes place at this point.

Inputting data. Lines 6000–6510 form the input routine. Most of the work is done in a subroutine, lines 6195–6510. This subroutine is also

Listing 2 continued.

```
11020 PRINT "Are you sure you want to load a file (you haven t saved"
11025 INPUT "the present file since you last changed it)?  ",I$
11030 IF I$<>"YES" THEN 1010
11035 INPUT "Which file would you like to load?  ",F$
11037 IF LEN(F$)=0 THEN 1010
11038 IF F$(1,1)<>"F" THEN 11040
11039 PRINT "Sorry, names cannot begin with `F'."\GOTO 1010
11040 K1=FILE(F$)\IF K1>=0 THEN 11050
11045 PRINT "Sorry, that file doesn't exist."\GOTO 1010
11050 IF K1=3 THEN 11060
11055 PRINT "Sorry, that's not a BASIC data file."\GOTO 1010
11060 OPEN #1,F$
11065 READ #1,K3
11070 FOR J=1 TO K3\READ #1,N$(J*60-59,J*60)\NEXT J
11075 CLOSE #1
11080 F1=0\F2=1\P=1\GOTO 1010


12000 REM  *** LIST THE SONG ***
12015 INPUT "Memory range to list (first, last):  ",K1,K2
12020 IF K1<=K2 THEN 12030
12025 PRINT "The first number must be the smaller."\GOTO 12015
12030 IF K1>=1 AND K2<=999 THEN 12040
12035 PRINT "Memory only goes from 1 to 999."\GOTO 12015
12040 INPUT "Would you like `sharp' or `flat' notation?  ",I$
12041 IF LEN(I$)=0 THEN 12055
12043 C3=0\IF I$(1,1)="S" THEN C3=1
12045 IF I$(1,1)="F" THEN C3=2
12050 IF C3>0 THEN 12060
12055 PRINT "Please enter `SHARP' or `FLAT'."\GOTO 12040
12060 INPUT "Would you like the listing printed?  ",I$
12065 F3=0\IF LEN(I$)=0 THEN 12075
12070 IF I$(1,1)="Y" THEN F3=1
12075 FOR J=K1 TO K2
12080 PRINT #F3,J,
12085 FOR K=1 TO 6\W(K)=ASC(N$(J*6-6+K,J*6-6+K))\NEXT K
12090 FOR K=1 TO 3
12095 IF W(K*2-1)=0 THEN 12235
12100 IF W(K*2-1)<>255 THEN 12110
12105 PRINT #F3,TAB(15),"TEMPO  ",5000/W(K*2),\EXIT 12240
12110 IF W(K*2-1)<>128 THEN 12120
12115 PRINT #F3,TAB(K*15),"VOLUME ",2*W(2*K),\GOTO 12235
12120 IF W(K*2-1)<>48 THEN 12130
12125 PRINT #F3,TAB(K*15),"R",\GOTO 12145
12130 K3=INT(W(K*2-1)/16)\K4=W(K*2-1)-K3*16
12135 IF C3=1 THEN PRINT #F3,TAB(K*15),K3,C1$(K4*2-1,K4*2),
12140 IF C3=2 THEN PRINT #F3,TAB(K*15),K3,C2$(K4*2-1,K4*2),
12145 K3=0\K4=W(K*2)
12150 IF K4>127 THEN K4=K4-128
12155 IF K4=48 THEN K3=1
12160 IF K4=32 THEN K3=1.3
12165 IF K4=36 THEN K3=2.5
12170 IF K4=24 THEN K3=2
12175 IF K4=16 THEN K3=2.3
12180 IF K4=18 THEN K3=4.5
12185 IF K4=12 THEN K3=4
12190 IF K4=8 THEN K3=4.3
12195 IF K4=9 THEN K3=8.5
12200 IF K4=6 THEN K3=8
12205 IF K4=4 THEN K3=8.3
12210 IF K4=3 THEN K3=16
12215 IF K4=2 THEN K3=16.3
12216 IF W(K*2)>127 THEN K3=-K3
12220 IF K3<>0 THEN 12230
12225 PRINT #F3,TAB(K*15+7),"INVALID",\GOTO 12235
12230 PRINT #F3,TAB(K*15+7),K3,
12235 NEXT K
12240 PRINT #F3\NEXT J
12245 GOTO 1010


13000 REM  *** SAVE TRANSLATED SONG ON DISK ***
13005 IF F1=1 THEN 13015
13010 PRINT "You must `PLAY' the song before doing a fast-save."\GOTO 1010
13015 INPUT "Which file would you like to use?  ",F$
13020 IF LEN(F$)=0 THEN 1010
13025 IF F$(1,1)="F" THEN 13035
13030 PRINT "Sorry, names of translated songs must begin with `F'."\GOTO 1010
13035 K1=FILE(F$)\IF K1>=0 THEN 13065
13045 INPUT "That file doesn't exist.  Shall I create it?  ",I$
13050 IF I$<>"YES" THEN 1010
13055 K2=INT((P1-41020+12)/256)+1
13060 CREATE F$,K2\GOTO 13080
13065 IF K1=3 THEN 13075
13070 PRINT "Sorry, that's not a BASIC data file."\GOTO 1010
13075 K2=INT((P1-41020+12)/256)+1
13080 OPEN #1,F$,K1
13085 IF K1>=K2 THEN 13095
13090 PRINT "Sorry, that file isn't large enough."\CLOSE #1\GOTO 1010
13095 WRITE #1,S,P1
13100 FOR J=41020 TO P1\WRITE #1,&EXAM(J)\NEXT J
13105 CLOSE #1\GOTO 1010


14000 REM  *** LOAD TRANSLATED SONG FROM DISK ***
14015 INPUT "Which file would you like to load?  ",F$
14020 IF LEN(F$)=0 THEN 1010
14025 IF F$(1,1)="F" THEN 14035
14030 PRINT "Sorry, names of translated songs begin with `F'."\GOTO 1010
14035 K1=FILE(F$)\IF K1>=0 THEN 14045
14040 PRINT "Sorry, that file doesn't exist."\GOTO 1010
14045 IF K1=3 THEN 14055
14050 PRINT "Sorry, that's not a BASIC data file."\GOTO 1010
14055 OPEN #1,F$
14060 READ #1,S,P1
14065 FOR J=41020 TO P1\READ #1,&K2\FILL J,K2\NEXT J
14070 CLOSE #1\F1=1\GOTO 1010
```

used by the insert routine. The input routine just steps through the large note array, filling it with note triplets entered from the keyboard.

The subroutine used to enter notes begins by reading in the octave and note. As notes are entered into the string array, they are encoded to save storage and compile time. Working on one note at a time produces a delay that is not noticeable while entering music and gets part of the translating done early. Each note is entered in the form octave-note-modifier (e.g., 2A, 4F#, 3C or 1Bb).

As soon as it is entered, the note is broken down into the three parts. The octave runs from 1 to 5, with the octave beginning with middle C being 3. This takes three bits. The note (A through G) is converted into a pointer to a table of values, which will produce the desired frequency when loaded into the 76489A.

Finally, the modifier (# or b) is used to offset the pointer by one to point to values corresponding to the black keys on a piano. (For ease in typing, S or F can be used in place of # or b, respectively.) This produces a pointer value running from 1 to 14, which requires four bits to store. So far, seven bits in the byte have been used. The last bit is used as a flag to indicate if this particular byte is not a note but rather a tempo, volume or rest. These each have their own special code.

After processing the note input, the routine asks for the duration of the note. This is entered as a number indicating the size note. A 4 is a quarter note, 16 is a sixteenth note, and so on. The program will handle notes from wholes to sixteenths.

You can add .5 to the duration to indicate a dotted note, or .3 to signify a triplet. These duration values are converted into equivalent 1/48 notes. Thus, 2 becomes 24, 4.5 becomes 18, and 8.3 becomes 4. This number, running from 1 to 63, is stored in the byte immediately following the code for the frequency of the note.

I chose the 1/48 note for the smallest unit because it is the largest number less than 63 that is evenly divisible by 48. Thus, the longest note possible is the whole note (length of 48), and the shortest is the sixteenth note (length of 3). All notes in between can be specified as dotted notes or triplets, or as standard length. If any note is to be tied to the following note, you set the most significant bit of the duration byte to 1; otherwise, it is 0. In this way the code for all three tone generators occupies six bytes of the string.

Inserting notes. Lines 7000–7065 handle the insert routine. This is nearly the same as the input routine, except that before a new triplet is put in the large array the location to be used and all following locations are pushed up one spot. This lets you insert new notes between existing notes.

Deleting notes. Lines 8000–8060 delete notes from the memory. You do this by moving the notes following the undesired group of notes down to lower addresses, thus overwriting the unwanted block of notes.

Clearing memory. Lines 9000–9045 clear the memory by writing blanks to all locations. If the present song has been modified and not been saved, a warning gives you the opportunity to back out if you really did want to save the song first.

Saving song files. Lines 10000–10340 save the present song on the disk. You'll have to rewrite this entire section to match your own mass storage device unless you have the North Star disk system. You use this routine to check for errors and verify that the specified file exists, is the right type and is large enough to hold the song.

Loading files from disk. Lines 11000–11080 load the song memory from the disk. This routine must match your save routine.

Listing a Song

Listing the song in the memory is handled by lines 12000–12245. Since the input routine has partially compressed the data, this section must expand it back out to octave, note and duration before printing. Before this can be done, you must specify whether you prefer sharp or flat notation. Fortunately, most songs are written using mostly sharps or mostly flats, so most notes will be listed in the same form in which they were typed. As for the notes that aren't, you'll just have to get used to them (or rewrite the program).

The list command asks for the range of addresses to be displayed, whether sharp or flat notation is preferred and whether to list to the CRT or printer. Then you begin decoding the compressed data.

First, the frequency byte is decoded. The three bits containing the octave are masked off and saved. The four bits indicating the pointer to the bottom octave table are used to calculate the address of the substring that contains the mnemonics for the notes (such as A# or C). You then print the octave, followed immediately by the note mnemonic.

Since the notes are compressed before they are written into the memory, at this point you don't know whether a particular black key was entered as a sharp or a flat. For instance, both F sharp and G flat are the same frequency, and both indicate the same key on a piano. This is why you must tell the program whether you prefer sharps or flats before the listing begins.

Two strings actually contain the alphabetic representations of the notes: one for flat and the other for sharp. After you print the octave and note, you pull the duration from the memory. It is converted back to the input format, using a series of IF statements since each value can only indicate one possible note size. If you can't find the value after checking all the legal sizes, an error message is printed for the duration.

Saving a Translated Song

Lines 13000–13105 save a translated song on the disk. Again, you'll have to change this section of the program to match your mass storage device. I added this and the next section about a week after the previous sections were written and debugged. Even on a 4 MHz Z-80, the rate of translation of a song is only about 100 note triplets per minute. Thus, songs of 550 notes take 5-1/2 minutes to translate every time they are loaded in and played.

This gets tedious after a few days. This routine peeks at the bytes after they have been written to the output table and saves them on the disk. This way you can reconstruct the output table directy without translating the song each time it is loaded and played, thus saving much time.

Loading a Translated Song

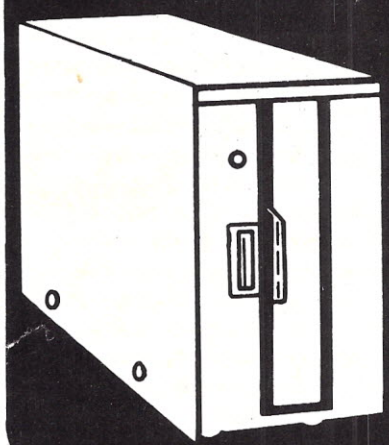
Lines 14000–14070 load a translated song into memory from the disk. This must match the previous section's format.

For those of you who want to dig into the program, Table 1 lists most of the variables used in EDIT2 (Listing 2). Each variable is followed by a brief description of what it represents.

Once you've gotten the two programs loaded into your computer, pick one of your favorite songs and key it in. If it's been many years since

VR DATA'S DISK DRIVE HEADQUARTERS

DISK HEAD CLEANERS
5-1/4" $14.95
8" 3M CLEANER
$24.95



77 TRACK DRIVES $545
NEW LOW PRICE
TRS-80 Model I compatible

40 TRACK DRIVES $340
NEW LOW PRICE
TRS-80 Model I compatible

● ORDER NOW TOLL FREE 1 (800) 345-8102 ● IN PENNSYLVANIA (215) 461-5300 ●

MODEL II
OVERSTOCK SALE
64K
$3400.

6.3 MEG HARD DISK WINCHESTER
Superbrain, Apple, TRS-80
$2445.

●AUTHORIZED CENTRONICS DISTRIBUTOR●

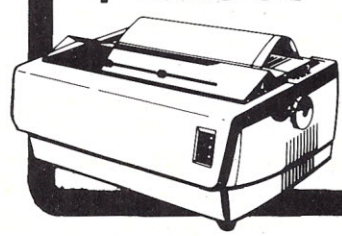
SUPERBRAIN™
BY INTERTEC
64K $2995.00
complete with
5-1/4" disk drives ● in stock



MINI DISK DRIVE EXTENDER BOARD
$14.95

EXTENDED 1 YEAR WARRANTY
MINI DISK DRIVES $45.00
Call For Details

EPA 250*
*Electronic Printing Ability 250 wpm.
DAISY WHEEL PRINTER
by VR Data
$2195.



*Parallel or Serial Interface
*25 cps , 45 cps Optional (Add $600.)
*Tractors Optional (Add $250.)

MODEL III
IMMEDIATE DELIVERY
● CALL FOR PRICES ●

ALL RADIO SHACK COMPUTERS 10% OFF

VR DATA SELLS MANY BRANDS OF COMPUTER HARDWARE AND PERIPHERALS. CALL FOR PRICES

VR Data ✓64
777 HENDERSON BLVD.
FOLCROFT, PA 19032

WE SERVICE MANY BRANDS OF COMPUTER EQUIPMENT.
CALL FOR CONSULATION AND ESTIMATE.
DEALER INQUIRES INVITED ● BIDS ACCEPTED ● ABOVE PRICES ARE CASH DISCOUNTED, CALL FOR OTHER TERMS.
ORDER NOW ● TOLL FREE 1 (800) 345-8102 ● IN PENNSYLVANIA (215) 461-5300

N$(6060)	1010, six-byte note triplets.
B$(60)	A ten-note buffer for use in inserts, deletes and clears.
I$(6)	Holds user's input.
P	Address pointer to N$, between 1 and 999 inclusive.
T(14)	Values for bottom octave frequencies.
V(3)	Volumes of tones 1, 2 and 3, respectively, in dB/2 of attentuation.
O(3)	Corresponding tone generator is on if 1, off if 0.
S	Length of 48th note in milliseconds.
L(3)	Length of time in 48th notes until corresponding tone generator's note is over. If −99, tone generator is off.
J,J1,. . .	Miscellaneous temporary variables.
K,K1,. . .	Miscellaneous temporary variables.
F$(10)	File name for disk access.
C1$(28)	Note names using sharps.
C2$(28)	Note names using flats.
C3	Flag: 1 for sharps, 2 for flats.
N	Address of 76489A.
F1	Flag: 0 for song not played, 1 for song played.
F2	Flag: 0 for file not saved since last change, 1 for file saved since last change.
F3	Flag: 0 for list on CRT, 2 for list on printer.
F4	Flag: 1 for END input during note input, 0 for other input.
W(6)	Working storage for bytes of note triplet.
P1	Pointer to memory for translated bytes.
P2	Machine-language program calling address.
N1$(3)	Note currently being played on corresponding tone generator.
T1(3)	Tie flag: 0 for not tied, 1 for tied.

Table 1. Important variables used in EDIT2 with a description of what they each represent.

you've even looked at a piece of sheet music, reacquaint yourself with how to read music. Fast-paced songs generally come out sounding better than slow ones, so don't start out with "Auld Lang Syne."

User's Guide

After you load the program and type RUN, the initialization routine clears out all the note memory, turns off the 76489A and waits for you to tell it what else to do. To begin entering a song, type RUN. The screen will be cleared and the address to be filled next will be displayed. Initially it will be the first location.

Following the prompts, key in the notes and durations for one, two or three tone generators as required. The note is entered in the format octave-note-modifier. The octave is a number from 1 to 5 inclusive. C is the lowest note in each octave, and middle C is in octave 3. The note is the letter name of the note, from A to G. The modifier indicates whether the note is sharp or flat. # or S indicates sharp, while b or F indicates flat. The modifier is left off for regular notes.

You'll have to remember the key signature of the music you're entering and type each note with the proper modifier. Finally, hit carriage return after you have specified the note as above. If one or more of the three tone generators is not used on a particular note triplet, simply hit carriage return without typing in any note.

After each frequency is typed in and processed, the program will prompt you for the duration. The duration is entered as 1 for a whole note, 2 for a half note, 4 for a quarter note, 8 for an eighth note and 16 for a sixteenth note.

You indicate a dotted note, which is sounded for half again as long as an undotted note, by appending .5 to the length of the note. A musical triplet, as opposed to one of the program's note triplets, refers to a note that is sounded for two-thirds as long as a standard note. It is indicated by appending .3 to the length of the note. Thus, a dotted quarter note is typed in as 4.5, and one note of an eighth note triplet is typed in as 8.3.

To set the tempo as part of the song, type TEMPO when the program asks for the first note of a triplet. To set the volume of a tone generator, type VOLUME when the program prompts for the note. In the above cases the program will prompt you for the necessary information. A rest is indicated by typing R for the note. Don't forget that rests must have a length specified.

Remember that all the tone generators are turned off when the program is loaded and RUN, so if you want to hear the song you're keying in, you'd better set the tone generators to the appropriate volume before entering any of the notes of the song. Otherwise, it will be played in total silence.

When you wish to stop entering notes into the memory, type END for any note in a triplet, and you'll be back in the command mode. The entire triplet containing the END is ignored.

To rework a section of the song already entered, or to continue on after having stopped in the middle of a song the previous day, type GOTO. The program will ask which location you wish to set the pointer to.

To insert notes between existing notes, use the GOTO command to set the pointer to the address you wish to insert ahead of. Then type INSERT and key in notes as described in the input section above. Use END to leave the insert mode.

To delete a note or block of notes from memory, use the GOTO command to position the pointer at the first location to be deleted. Then type DELETE and the program will ask how many locations are to be deleted. This clears the locations to be deleted and pulls down the notes following the last deleted location to fill the gap.

If you change a note, you don't have to delete it and insert the new note. The input function will overwrite the old note with the new one. This also applies if a block of notes is to be modified, as long as you have the same number of notes when you finish as when you began.

To alter the tempo, type TEMPO. The program will tell you what the tempo is set to and let you change it. Playing a song may change the tempo if it is specified as part of the song. That is treated exactly as if it were entered from the keyboard. If the song specifies the tempo, you can still play it at a new tempo by first playing it, then changing the tempo and replaying it at the new tempo.

If you want to start over, type CLEAR. This sets the memory back to blanks and the pointer back to location 1.

To check notes in the memory or document songs, use the list function. After you type LIST, the program will ask the range of locations to list. If you are only interested in one address, enter it for both the first location and the last location. After accepting the address range, the program asks whether you prefer sharp or flat notation. Finally, the program

AT LAST!

Mass production prices on this high quality software. Buy direct and save 50%. Now, also available for CBASIC on CP M and MBASIC on HEATH HDOS.

DATA BASE MANAGER Mod-I $69 Mod-II $199
You can use it to maintain a data base & produce reports without any user programming. Define file parameters & report formats on-line. Key random access, fast multi-key sort, field arith., label, audit log. No time-consuming overlays. 500 happy users in a year. Mod-II version has over 50 enhancements including 40 fields max. 'IDM-M2 is great!' - 80-US.

A/R Mod-I $69 Mod-II $149
Invoices, statements, aging, sales analysis, credit checking, form input, order entry. As opposed to most other A/R, ours can be used by doctors, store managers, etc.

WORD PROCESSOR Mod-I $49 Mod-II $49
Center, justification, indentation, page numbering. Mod-I version features upper/lower case without hardware change!

MAILING LIST Mod-I $59 Mod-II $99
The best! Compare and be selective. Form input, 5-digit selection code, zip code ext., sort any field, multiple labels. Who else offers a report writer?

INVENTORY Mod-I $99 Mod-II $149
Fast, key random access. Reports include order info, performance summary, E.O.Q., and user-specified reports. Many have converted their inventory system to ours!

GL, A/R, A/P, & PAYROLL Mod-II $129 each
Integrated accounting package. ISAM, 100+ page manual, Uses 80 column screen, not 64. A $1,000 value. Dual disk required.

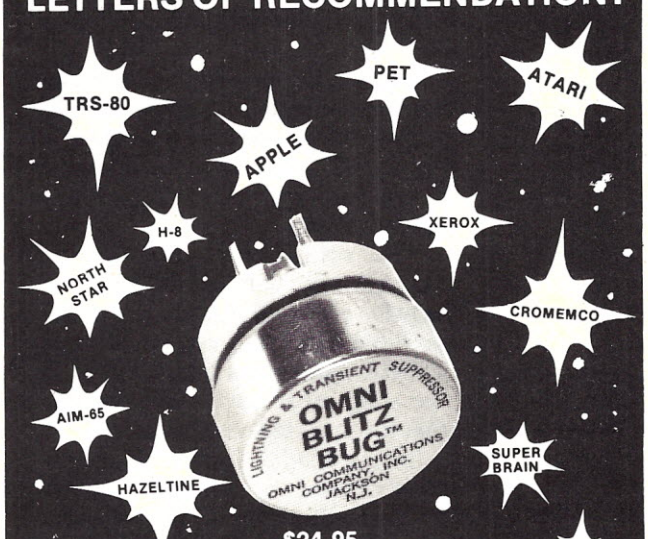
L216, a cassette package of 10 business programs for Level II 16K systems, $59. Includes word processor & data base. Poker game $19.

Most programs are on-line, interactive, random access, bug free, documented and delivered on disks. Mod-I programs require 32K TRSDOS. Don't let our low prices fool you! If still not convinced, send SASE (28¢) for catalog.

MICRO ARCHITECT, INC.,
96 Dothan St., Arlington, MA 02174 ✓108

BLITZ BUG LIGHTNING & TRANSIENT VOLTAGE SUPPRESSOR

LETTERS OF RECOMMENDATION:



$24.95

DELIVERY FROM STOCK
ADD $1.50 SHIPPING & HANDLING
N.J. RESIDENTS ADD 5% SALES TAX
DEALER INQUIRIES INVITED. ✓276

OMNI COMMUNICATIONS COMPANY, Inc.
200 WEST COUNTY LINE ROAD
R.D. 3, BOX 200
JACKSON, NEW JERSEY 08527
(201) 928-1477 (609) 259-2617

TRS-80
BASIC PLUS
ZBASIC, SIMUTEK'S BASIC COMPILER

The following **BASIC PROGRAM,** written on the TRS-80, was compiled using MICROSOFT'S BASIC COMPILER and SIMUTEK'S BASIC COMPILER. *We feel the results speak for themselves!*

```
10 '  SPEED TEST
    SIMUTEK ZBASIC COMPILER VS. MICROSOFT COMPILER
15 CLS:PRINT@0,"HIT A KEY WHEN READY TO START TEST";
20 I$=INKEY$:IFI$=""THEN20ELSEFORZ=1TO10:
FORX=15360TO16383:POKEX,191:PRINTPEEK(X);:NEXTX
30 FORX=0TO127:FORY=0TO47:SET(X,Y):NEXTY,X
:FORX=127TO0STEP-1:FORY=47TO0STEP-1:RESET(X,Y)
:NEXTY,X:FORX=1TO1000:GOSUB1000:NEXTX,Z
40 CLS:PRINT"FINISHED WITH PROGRAM TEST";:STOP
1000 RETURN
```

BASIC PROGRAM SIZE: 329 BYTES
PROGRAM RUN: 22 Minutes, 37 Seconds

Compilers:	Microsoft	Simutek
Compiled Size:	10057 Bytes	1228 Bytes
Compile Time:	14 Minutes	0.75 Seconds
Program Run:	17 Min. 04 Sec.	1 Min. 46 Sec.
System Req:	48K 1 Disk	16K LV II or 32-48K Disk
Price:	$195.00	Tape $99.00, Disk $129.00

ZBASIC is an "Interactive Compiler". This means it is resident while you write your basic programs. You may compile your program and run it or save it, without destroying your resident basic program! In fact, jumping back and forth between your compiled program and your basic program is one of it's best features!

Simutek's compiler allows saving your "compiled" programs to tape or disk. Programs may then be loaded by use of the system command for tape, or as a /CMD file from DOS. This makes it extremely hard for people to "pirate" your programs.

Best of all, Simutek does not charge royalties on programs you sell that are compiled with ZBASIC! (Microsoft charges 10% or $200 a year!)

Why use a complicated "Assembler" to write machine language programs when you can write them in ZBASIC?

Some of the basic commands supported by ZBASIC:

FOR	NEXT	STEP	IF	THEN	ELSE	PEEK	ON GOTO
SET	RESET	POINT	CHR$	RANDOM	RND ( )	POKE	ON GOSUB
DATA	READ	RESTORE	END	GOTO	GOSUB	CLS	
INPUT	INKEY$	LET	STOP	OUT	INP	RETURN	
PRINT	LPRINT	PRINT@	USR	SGN	INT	ABS	
SQR	LEN	ASC	VAL				

INT. MATH: +, —, *, /, AND, OR, SQR

Model I TRS-80 (or PMC-80) Only
ZBASIC Tape Version: 16K Level II TRS-80 $99.00
ZBASIC Disk Version: 32 or 48K 1 Disk Sys. $129.00
ZBASIC Manual Only: $25.00

Credit Card or C.O.D. Call **Toll Free: (800) 528-1149**
or send check or money order to:

SIMUTEK ✓12
COMPUTER PRODUCTS™

P.O. Box 13687 Tucson, AZ 85732 (602) 886-5880
(C.O.D. Available $3.00 Extra)
TRS-80 is a TM of Radio Shack, a Tandy Corp.

asks whether you'd like the listing printed on a hard-copy device (if you have one). Type YES for a printed listing, NO or just carriage return for a listing on the CRT.

Once the listing begins, you can't stop it, so if you have specified a large range of memory, it may take some time. The listing does not stop when the end of the song is reached. You need to have some idea where the end is before you start so you can put it in for the last location to be listed.

Once you have typed a song into the memory, the best thing to do is save it on your mass storage device. This is especially important the first few times after you have keyed in the program, when the possibility of bugs is high. It is frustrating to spend a half hour (or more) typing in a song only to get a syntax error when you try to play it. Since restarting the program clears the variables, the song must be reentered.

To save a song, type SAVE. The program will ask for the name of the file to be used. You can use an existing file, as when you are putting the finishing touches on a previously entered song, or use a new file. In the latter case the program will create the file for you. File names cannot begin with the letter F, which is reserved to indicate a file containing a song in translated format (F stands for fast load).

Conversely, type LOAD to read a song into the memory from mass storage. Again, the program asks for the name of the file.

Listing 3. "Jesu, Joy of Man's Desiring" as listed by EDIT2. This is what the program types for a listing of a song in the memory. Column 1 is the address, columns 2 and 3 are the note and duration of tone generator number 1, columns 4 and 5 are the same for generator number 2, and columns 6 and 7, the same for generator number 3. EDIT2 does not utilize the noise generator.

```
1     TEMPO   119.04762
2     VOLUME  4       VOLUME  4       VOLUME  4
3      3B     2        3G     2        1G     4
4                                      2G     4
5      4C     4        3G     4        2E     4
6      4D     2        3G     2        1B     4
7                                      1E     4
8      4D     4        3G     4        2B     4
9      3B     2        3G     2        1G     4
10                                     2G     8
11     4C     4        3G     4        2E     4
12     4D     2.5      3G     2.5      2B     2.5
13     3B     2        3G     2        1G     4
14                                     2G     4
15     4C     4        3G     4        2E     4
16     4D     2        3G     2        1B     4
17                                     1E     4
18     4D     4        3G     4        2B     4
19     4C     4        3G     2        2E     2
20     3B     4
21     3A     4        3F#    4        R      4
22    VOLUME  6       VOLUME  6       VOLUME  6
23     R      8.3                     1G     4
24      3G    8.3
25      3A    8.3
26      3B    8.3      3D     4.3
27      4D    8.3
28      4C    8.3      2F#    8.3
29      4C    8.3      2G     4.3     2E     4
30      4E    8.3
31      4D    8.3      2A     8.3
32      4D    8.3      2G     4       1B     4
33      4G    8.3
34      4F#   8.3
35      4G    8.3      2B     4       2E     4
36      4D    8.3
37      3B    8.3
38      3G    8.3      1E     4
39      3A    8.3
40      3B    8.3
41      4C    8.3      2A     4.3     1A     4
42      4D    8.3
43      4E    8.3      2F#    8.3
44      4D    8.3      2G     4.3     1B     4
45      4C    8.3
46      3B    8.3      2D     8.3
47      3A    8.3      2E     4.3     2C     4
48      3B    8.3
49      3G    8.3      2B     8.3
50      3F#   8.3      2A     4       2D     4
51      3G    8.3
52      3A    8.3
53      3D    8.3      2A     4       2F#    4
54      3F#   8.3
55      3A    8.3
56      4C    8.3      2A     4       2D     4
57      3B    8.3
58      3A    8.3
59      3B    8.3      2G     4
60      3G    8.3
61      3A    8.3
62      3B    8.3      2G     4.3     2E     4
63      4D    8.3
64      4C    8.3      2F#    8.3
65      4C    8.3      2G     4.3     2C     4
66      4E    8.3
67      4D    8.3      2A     8.3
68      4D    8.3      2B     4       1B     4
69      4G    8.3
70      4F#   8.3
71      4G    8.3      2B     4       2E     4
72      4D    8.3
73      3B    8.3
74      3G    8.3      2B     4       2D     4
75      3A    8.3
76      3B    8.3
77      3E    8.3      2A     4.3     2C     4
78      4D    8.3
79      4C    8.3      2F#    8.3
80      3B    8.3      2G     4.3     2C#    4
81      3A    8.3
82      3G    8.3      2E     8.3
83      3D    8.3      2A     4.3     2D     4
84      3G    8.3
```

More

Making Music

Once you have the song typed in and saved, the moment of truth arrives. Type PLAY to translate the song and play it on the 76489A circuitry. Translating takes about one minute per 100 note triplets on a 4 MHz Z-80; estimate your time accordingly.

The first time or two it's good to play the song after the first dozen notes have been entered just to verify that everything is working OK. When it's finished playing, you can go back to enter more simply by typing INPUT; you'll be back where you ended.

To hear the song again without having to re-translate it, type REPLAY, and it will immediately begin playing. At this point you can change the tempo and replay the song at a faster or slower rate.

The commands FSAVE and FLOAD are identical to SAVE and LOAD, except that they are used to save the translated version of a song. The file name must begin with F, and the song must have been played so that a translated version exists.

Listing 3 is J.S. Bach's "Jesu, Joy of Man's Desiring," printed by EDIT2. If you don't recognize the title, you'll probably recognize the song. It uses all three tone generators and is a good demonstration piece. The playing time is about two minutes. Even if you can't read music, you'll at least have one song in your repertoire.

If you have questions, please enclose a stamped, self-addressed envelope. Also, contact me if you want to swap songs on North Star single-density disk systems. ■

Listing 3 continued.

```
 85          3F#     8,3     3C      8,3
 86          3G      8,3     1G      4
 87          3B      8,3
 88          4D      8,3
 89          4G      8,3     1G      4,3
 90          4D      8,3
 91          3B      8,3     2G      8,3
 92          3G      8,3     2D      4,3
 93          3B      8,3
 94          4D      8,3     1B      8,3
 95          VOLUME  6       VOLUME  2       VOLUME  2
 96          R       4       3B      2       3G      2
 97          R       4
 98          VOLUME  2       VOLUME  2       VOLUME  2
 99           4C     4        3G     4        3E      4
100           4D     2        3A     4        2A      2
101                            3G     4
102           4D     4        3F#    4        2B      4
103           4C     2        3G     4        2B      4
104                           3D     2        2A      4
105           3B     4                        2G      4
106           3A     8,3      2F#    4        2D      4
107           3D     8,3
108           3E     8,3
109           3F#    8,3      3D     4,3
110           3A     8,3
111           3G     8,3      2D     8,3
112           3A     8,3      2D     4,3
113           4C     8,3
114           3B     8,3      2D     8,3
115           4C     8,3      1D     -4
116           3A     8,3
117           3F#    8,3
118           3D     8,3      1D     4,3
119           3F#    8,3
120           3A     8,3      2D     8,3
121           4C     8,3      2D     4,3
122           3B     8,3
123           3A     8,3      2D     8,3
124           3B     2        3G     2       3D      2
125           4C     4        3G     4       3E      4
126           4D     2        3G     4       3D      4
127                           3D     4       2B      4
128           3B     4        3G     4       2B      4
129           3A     8        3E     4       3C      8
130           3B     16                      2A      8
131           4C     16
132           3B     4        3F#    8       3D      8
133                           3E     8       2B      8
134           3A     4        3F#    4       3C      4
135           3G     8,3      3D     4       2B      4
136           3B     8,3
137           3A     8,3
138           3B     8,3      3D     4       2G      4
139           4D     8,3
140           4C     8,3
141           4C     8,3      2G     4       2E      4
142           4E     8,3
143           4D     8,3
144           4D     8,3      2G     4       1B      4
145           4G     8,3
146           4F#    8,3
147           4G     8,3      2B     4       2E      4
148           4D     8,3
149           3B     8,3
150           3G     8,3      3E     4,3     1E      4
151           3A     8,3
152           3B     8,3      3D     8,3
153           4C     8,3      3C     4,3     2E      4
154           4D     8,3
155           4E     8,3      2F#    8,3
156           4D     8,3      2G     4       1B      4
157           4C     8,3
158           3B     8,3
159           3A     8,3      2E     4,3     2C      4
160           3B     8,3
161           3G     8,3      2B     8,3
162           3F#    8,3      2A     4       2D      4
163           3G     8,3
164           3A     8,3
165           3D     8,3      2A     4       2F#     4
166           3F#    8,3
167           3A     8,3
168           4C     8,3      2D     4
169           3B     8,3
170           3A     8,3
171           3B     8,3      2G     4
172           3G     8,3
173           3A     8,3
174           3B     8,3      2G     4,3     2E      4
175           4D     8,3
176           4C     8,3      2F#    8,3
177           4C     8,3      2G     4,3     2C      4
178           4E     8,3
179           4D     8,3      2A     8,3
180           4D     8,3      2B     4       1B      4
181           4G     8,3
182           4F#    8,3
183           4G     8,3      2B     4       2E      4
184           4D     8,3
185           3B     8,3
186           3G     8,3      2B     4       2D      4
187           3A     8,3
188           3B     8,3
189           3E     8,3      2A     4,3     2C      4
190           4D     8,3
191           4C     8,3      2F#    8,3
192           3B     8,3      2G     4,3     2C#     4
193           3A     8,3
```

(More)

APPLE II Ⓐ **TRS·80** Ⓣ

QUALITY DISK SOFTWARE

VISA master charge

☐ HOME FINANCE PAK I: Entire Series $49.95 ⒶⓉ

☐ CHECK REGISTER AND BUDGET: This comprehensive CHECKING ACCOUNT MANAGEMENT SYSTEM not only keeps complete records, it also gives you the analysis and control tools you need to actively manage your account. The system provides routines for BUDGETING INCOME AND EXPENSE, AUTOMATIC CHECK SEARCH, and BANK STATEMENT RECONCILING. CRT or printer reports are produced for ACTUAL EXPENSE vs BUDGET, CHECK SEARCH DISPLAY, RECONCILIATION REPORT and CHECK REGISTER DISPLAY by month. Check entry is prompted by user-defined menus of standard purposes and recipient codes, speeding data entry and reducing disk storage and retrieval time. Six fields of data are stored for each check: amount, check no., date, purpose, recipient and TAX DEDUCTIBLE REMINDER. CHECK SEARCH routines allow searching on any of these data fields. Routines are also provided for CHECK SORT by date and check no., DATA EDITING and Report Formats. Up to 100 checks/mo. storage $39.95

☐ SAVINGS: Account management system for up to 20 separate Savings accounts. Organizes, files and displays deposits, withdrawals and interest earned for each account. Complete records shown via CRT or printer. $14.95

☐ CREDIT CARD: Get control of your credit cards with this program. Organizes, stores and displays purchases, payments and service charges for up to 20 separate cards. Use for credit cards or bank loans. CRT or printer reports $14.95

☐ UNIVERSAL COMPUTING MACHINE: $49.95 ⒶⓉ

A user programmable computing system structured around a 50 row x 50 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. User can define repeated functions common to a row or column greatly simplifying table setup. Hundreds of unique computing machines can be defined, used, stored and recalled, with or without old data, for later use. Excellent for sales forecasts, engineering design analysis, budgets, inventory lists, income statements, production planning, project cost estimates-in short for any planning, analysis or reporting problem that can be solved with a table. Unique curser commands allow you to move to any element, change its value and immediately see the effect on other table values. Entire table can be printed by machine pages (user-defined 3-5 columns) on a 40 column printer.

☐ COLOR CALENDAR: $29.95 Ⓐ

HI-RES color graphics display of your personal calendar. Automatic multiple entry of repetitive events. Review at a glance important dates, appointments, anniversaries, birthdays, action dates, etc. over a 1 year period. Graphic calendar marks dates. Printer and screen display a summary report by month of your full text describing each day's action item or event. Ideal for anyone with a busy calendar.

☐ BUSINESS SOFTWARE: Entire Series $159.95 ⒶⓉ

☐ MICROACCOUNTANT: The ideal accounting system for the small business. Based on classic T-accounts and double-entry bookkeeping, this efficient program records and produces reports on account balances, general ledger journals, revenue and expenses. Screen or 40 column printer reports. Handles up to 1000 journal entries per month up to 300 accounts. Includes a short primer in Financial Accounting. ... $49.95

☐ UNIVERSAL BUSINESS MACHINE: This program is designed to SIMPLIFY and SAVE TIME for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forecasting tools.

CASH FLOW ANALYSIS	PROFORMA BALANCE SHEET	SOURCE AND USE OF FUNDS
PROFORMA PROFIT & LOSS	SALES FORECASTER	JOB COST ESTIMATOR

Price, including a copy of the Universal Computing Machine $89.95

☐ BUSINESS CHECK REGISTER AND BUDGET: Our Check Register and Budget programs expanded to include up to 50 budgetable items and up to 400 checks per month. Includes bank statement reconciling and automatic check search (48K) $49.95

☐ ELECTRONICS SERIES: Entire Series $259.95 ⒶⓉ

☐ LOGIC SIMULATOR: SAVE TIME AND MONEY. Simulate your digital logic circuits before you build them. CMOS, TTL, or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full-fledged logic simulator capable of simulating the bit-time by bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including NANDS, NORS, INverters, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS and user-defined MACROS. Up to 40 user-defined, random, or binary input patterns. Simulation results displayed on CRT or printer. Accepts network descriptions from keyboard or from LOGIC DESIGNER for simulation. $159.95

☐ LOGIC DESIGNER: Interactive HI-RES Graphics program for designing digital logic systems. A menu driven series of keyboard commands allows you to draw directly on the screen up to 15 different gate types, including 10 gate shape patterns supplied with the program and 5 reserved for user specification. Standard patterns supplied are NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 Bit COUNTER and N-BIT SHIFT REGISTER. User interconnects gates just as you would normally draw using line graphics commands. Network descriptions for LOGIC SIMULATOR generated simultaneously with the CRT diagram being drawn. $159.95

MANUAL AND DEMO DISK: Instruction manual and demo disk illustrating capabilities of both programs $29.95

☐ MATHEMATICS SERIES: Entire Series $49.95 Ⓐ

☐ STATISTICAL ANALYSIS I: This menu driven program performs SIMPLE LINEAR REGRESSION analysis, determines the mean, standard deviation and plots the frequency, distribution of user-supplied data sets. Printer, Disk, I/O and edit routines included (32K min.) $19.95

☐ NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, find the MAXIMA and MINIMA and list the INTEGRAL VALUE. $19.95

☐ MATRIX: A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS. Disk I/O for data save. Specify 55 eqn. set (48K) or 35 eqn. (32K) $19.95

☐ 3-D SURFACE PLOTTER: Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3-dimensional surfaces from any 3-variable equation. Disk save and recall routines for plots. Menu driven to vary surface parameters. Hidden line or transparent plotting $19.95

☐ ACTION ADVENTURE GAMES: Entire Series $29.95 Ⓐ

☐ RED BARON: Can you outfly the RED BARON? This fast action game simulates a machine-gun DOG-FIGHT between your WORLD WAR I BI-PLANE and the baron's. You can LOOP, DIVE, BANK or CLIMB in any one of 8 directions - and so can the BARON. in HI-RES graphics $14.95

☐ BATTLE OF MIDWAY: You are in command of the U.S.S. HORNETS' DIVE-BOMBER squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga. You must fly your way through ZEROS and AA FIRE to make your DIVE-BOMB run. In HI-RES graphics $14.95

☐ SUB ATTACK: It's April, 1943. The enemy convoy is headed for the CORAL SEA. Your sub, the MORAY, has just sighted the CARRIERS and BATTLESHIPS. Easy pickings. But watch out for the DESTROYERS - they're fast and deadly. In HI-RES graphics $14.95

☐ FREE CATALOG - All programs are supplied on disk and run on Apple II w/Disk & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders shipped within 5 days. Card users include card number. Add $1.50 postage and handling with each order. California residents add 6½% sales tax. Foreign orders add $5.00 postage and handling.

Make checks payable to:

SPECTRUM SOFTWARE ✓306

P.O. Box 2084 142 Carlow, Sunnyvale, CA 94087

For phone orders - 408-738-4387

DEALER INQUIRIES INVITED

✓Reader Service—see page 226

TEXAS COMPUTER SYSTEMS

Radio Shack

Authorized Sales Center, OFFERS

LOWEST PRICES on

TRS-80

COMPUTERS

Model II 64K $3349	**Pocket Computer** $199 cassette interface $43	**Model III** 4k LI $599
Mod. III $2119 32K 2 Disks	**Model III** 16K LIII $844	**Color Computer** 4K LI $322

PRINTERS

DAISY WHEEL II $1688 Carbon Ribbon typewriter quality for word processing. 43 characters per second, standard Centronics parallel interface. Full 16" width, takes individual sheets on friction feed platen. Tractor feed $250 extra. The fastest daisy wheel available at this low price.

EPSON MX-80 $ CALL List $645 Letter quality matrix similar to the Line Printer IV and the Centronics printer but has full software control of 40, 80, 66, or 132 columns. 80 cps bidirectional printing, tractor feed, disposable printhead. $300 less than the nearest competitive printer, it's the best buy in a letter quality multi-strike printer. Our price is too low! to advertise.

ANADEX 9500/9501 $1385 200 cps, 7x9 or 9x9 matrix, dot addressable graphics, excellent quality and price. 10, 12, 13.3 characters/in, 6 or 8 lines/in, standard parallel, serial, and current loop interfaces included.

LINE PRINTER VI $999 Fast, versatile—takes both single sheets and pin fed forms, 100 cps bidirectional, low profile. List $1160

LINE PRINTER III $1685 120 cps, designed for heavy business use, bidirectional, 7x9 matrix

LINE PRINTER IV $825 Letter quality multi strike matrix, 80 or 132 columns, friction feed.

ACCESSORIES—SOFTWARE

MODEL II

CP/M The best version of **CP/M** available for the Model II. Cursor addressing, software control of all ports. **596K** on each drive, auto density select, many, many more. 150 page manual. **$180** (P&T)

SCRIPSIT Word Processing System. Extensive command set allows global search and many other features not found on other systems. Use with Daisy Wheel and other printers. Excellent value. **$263.**
Profile II Filing System allows immediate access and review of up to 20,000 individual user defined records. Can print labels or reports in any format. **$158.**

General Ledger allows up to 504 accounts with user defined account numbers. Up to 11,420 entries per month. Audit trails and reports generated. Easy document and error recovery. **$175.**
Inventory handles up to 3,000 line items, 200 vendors with each item quantity up to 999,999. Suggested reorder report, sales trends and performance **$175.**
SNAP II Extended Basic. Several enhancements to TRSDOS BASIC including powerful editing commands and a variable cross reference for debugging programs. **$190.**

MODEL II

HOST/TERM allows the Model II to become controlled remotely by another terminal or Model II. $50.
SPOOLER allows disk spooling of printed output or in the normal mode, greatly enhances system's speed and performance. **$99.**
VISTA Shugart Disk Expansion System. Uses the same drive as the Model II console.1 Drive **$949.** 2 Drive **$1424,** 3 Drive **$1899.**

MODEL I AND III

PERCOM DOUBLER allows double density on the Model I. Easy installation, comes with the DOUBLDOS operating system on disk. 150k on each drive. **$209.** Ask about NEWDOS conversion for Double Density.
EXPANSION INTERFACE 0k Ram $249
NEWDOS-80 $139

PERCOM DISKS $ CALL

We have all Radio Shack computers and accessories, and a number of other brand computer items. Call us for your specific needs and get a copy of our catalog.

★ No taxes on out-of-state shipments. Texas res. Add 5%.
★ All merchandise is new, checked and guaranteed by manufacturer.
★ Payment: Money Order, Cashier's Check, Certified Check. Personal Checks require 3 weeks to clear. VISA, MASTERCHARGE—Add 3%.
★ Prices subject to change at any time.
★ Delivery of merchandise is subject to availability.

TEXAS COMPUTER SYSTEMS

328

An Authorized **RADIO SHACK®** Sales Center F701

Box 1174, Brady, Texas 76825

TOLL FREE Number 800-351-1473

Texas Residents 915-597-0673

Listing 3 continued.

```
194     3G    8,3   2E    8,3
195     3D    8,3   2A    4,3   2D    4
196     3G    8,3
197     3F#   8,3   3C    8,3
198     VOLUME 0    VOLUME 0    VOLUME 0
199     3B    2     3G    2     3D    2
200     4C    4     3G    4     3E    4
201     4D    2     3A    4     2A    2
202                 3G    4
203     4D    4     3F#   4     2B    4
204     4C    2     3G    4     2B    4
205                 3D    2     2A    4
206     3B    4                 2G    4
207     3A    8,3   2F#   4     2D    4
208     3D    8,3
209     3E    8,3
210     3F#   8,3   3D    4,3
211     3A    8,3
212     3G    8,3   2D    8,3
213     3A    8,3   2D    4,3
214     4C    8,3
215     3B    8,3   2D    8,3
216     4C    8,3   1D    -4
217     3A    8,3
218     3F#   8,3
219     3D    8,3   1D    4,3
220     3F#   8,3
221     3A    8,3   2D    8,3
222     4C    8,3   3D    4,3   2D    4,3
223     3B    8,3
224     3A    8,3   3D    8,3   2D    8,3
225     VOLUME 2    VOLUME 2    VOLUME 2
226     3B    2     3G    2     3D    2
227     4C    4     3G    4     3E    4
228     4D    2     3G    4     3D    4
229                 3D    4     2B    4
230     3B    4     3E    4     2B    4
231     3A    8     3E    4     3C    4
232     3B    16
233     4C    16
234     3B    4     3F#   8     3D    4
235                 3E    8
236     3A    4     3F#   4     3C    4
237     VOLUME 6    VOLUME 6    VOLUME 6
238     3G    8,3   1G    4
239     3B    8,3
240     3A    8,3
241     3B    8,3   3D    4     2G    4
242     4D    8,3
243     4C    8,3
244     4C    8,3   2G    4     2E    4
245     4E    8,3
246     4D    8,3
247     4D    8,3   2G    4     1B    4
248     4G    8,3
249     4F#   8,3
250     4G    8,3   2B    4     2E    4
251     4D    8,3
252     3B    8,3
253     3G    8,3   1E    4
254     3A    8,3
255     3B    8,3
256     4C    8,3   2E    4,3   1A    4
257     4D    8,3
258     4E    8,3   2F#   8,3
259     4D    8,3   2G    4     1B    4
260     4C    8,3
261     3B    8,3
262     3A    8,3   2E    4,3   2C    4
263     3B    8,3
264     3G    8,3   2B    8,3
265     3F#   8,3   2A    4     2D    4
266     3G    8,3
267     3A    8,3
268     3D    8,3   2A    4     2F#   4
269     3F#   8,3
270     3A    8,3
271     4C    8,3   3F#   4     2D    4
272     3B    8,3
273     3A    8,3
274     3B    8,3   3D    4     2G    4
275     3G    8,3
276     3A    8,3
277     3B    8,3   2G    4,3   2E    4
278     4D    8,3
279     4C    8,3   2F#   8,3
280     4C    8,3   2G    4,3   2C    4
281     4E    8,3
282     4D    8,3   2A    8,3
283     4D    8,3   2B    4     1B    4
284     4G    8,3
285     4F#   8,3
286     4G    8,3   2B    4     2E    4
287     4D    8,3
288     3B    8,3
289     3G    8,3   2B    4     2D    4
290     3A    8,3
291     3B    8,3
292     3D    8,3   2A    4,3   2C    4
293     4D    8,3
294     4C    8,3   2F#   8,3
295     3B    8,3   2G    4.3   2C#   4
296     3A    8,3
297     3G    8,3   2E    8,3
298     3D    8,3   2A    4,3   2D    4
299     3G    8,3
300     3F#   8,3   3C    8,3
301     3G    8,3   2B    4     1G    8,3
302     3B    8,3                 R     8,3
```

More →

New for your PET
from OSBORNE/McGraw-Hill

NEW Second Edition

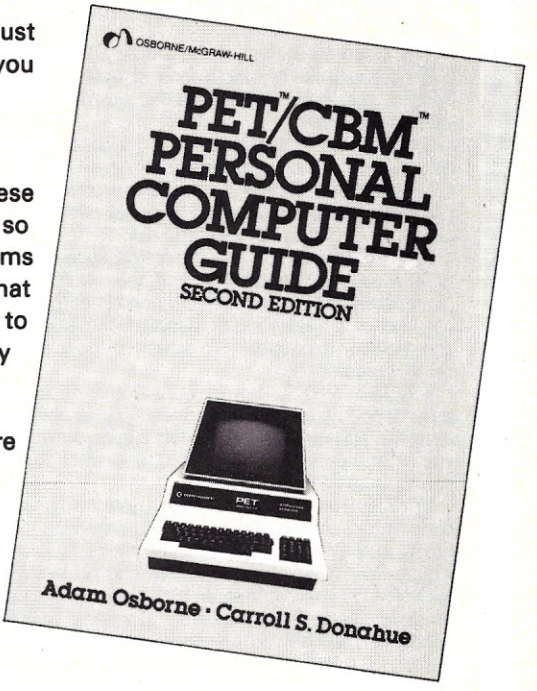
PET™/CBM™ Personal Computer Guide Second Edition

by Adam Osborne and Carroll S. Donahue

The PET/CBM Personal Computer Guide is a step-by-step guide that assumes no prior knowledge of computers. If you can read English, you can use this book.

This book provides the important information and documentation that PET/CBM users have sought for so long. After reading this book you will have a good understanding of what a computer — especially the PET/CBM computer — can do for you. If you've just bought a PET or CBM this is the book you must have to really understand your computer. By using the examples found in this book, you will quickly get your PET/CBM up and running. These examples are thoroughly documented so you can learn how and why the programs work. It is the "how" and the "why" that are important if you want to learn how to make your PET or CBM work efficiently for you.

This second edition contains even more useful information than the first edition of this book. The guide contains a wealth of information on everything from keyboard variations to a detailed description of PET and CBM memory.



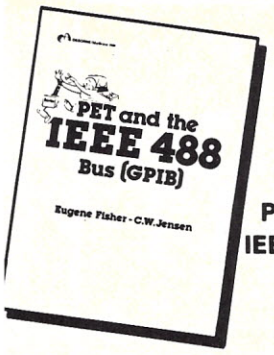
Included are:

Complete operating instructions for
- keyboard
- tape cassette
- disk

Description of all CBM BASIC statements
Optimal programming techniques including
- input/output programming
- file handling
- screen editing

Solutions to programming problems
CBM capabilities and limitations

#55-1 $15.00



PET and the IEEE 488 Bus (GPIB)

by E. Fisher and C. W. Jensen

This is the only complete guide available on interfacing PET to GPIB. Learn how to program the PET interface to control power supplies, signal sources, signal analyzers and other instruments. It's full of practical information, as one of its authors assisted in the original design of the PET GPIB interface.

#31-4 $15.99



NEW PET/CBM edition

Some Common BASIC Programs

by L. Poole, M. Borchers, C. Donahue

76 Programs you can use even if you don't know BASIC. This book gives you a variety of math power including personal finance, taxes and statistics as well as other programs you'll want like Recipe Cost and Check Writer. All programs can be run on a PET or CBM with 8K or more.

#40-3 $14.99



PET owners can purchase the programs ready-to-run on cassette or disk. Use the book as a manual for operating instructions and programming options.

Disk #33-0 $22.50
Cassette #25-X $15.00

Practical BASIC Programs

by L. Poole

These are 40 easy to use programs that each do something useful.

Income averaging, checkbook reconciliation, statistics, factorials, temperature conversion and musical transposition are just a few. It offers a wealth of practical computing power. Includes write-ups, program notes and instructional examples to help you realize the potential uses of each program.

#38-1 $15.99

6502 Assembly Language Programming

by L. Leventhal

Increase the capabilities and performance of PET (and other 6502-based computers) by learning to program in assembly language.

#27-6 $16.99

Book/Cassette/Disk		Price	Quantity	Amount
27-6	6502 Assembly Language Programming	$16.99		
55-1	PET Personal Computer Guide	$15.00		
31-4	PET and the IEEE 488 Bus (GPIB)	$15.99		
40-3	Some Common BASIC Programs PET/CBM ed. (book)	$14.99		
25-X	Some Common BASIC Programs PET Cassette	$15.00		
33-0	Some Common BASIC Programs PET Disk	$22.50		
38-1	Practical BASIC Programs	$15.99		

California residents add 6% sales tax.
S.F. BART residents add 6½% sales tax.

California resident tax
Shipping
Total Amount Enclosed

Shipping: (Shipping for large orders to be arranged)
- All foreign orders $4.00 per book for airmail
- $0.45 per book 4th class in the U.S. (allow 3-4 weeks)
- $0.75 per book UPS in the U.S. (allow 10 days)
- $1.50 per book special rush shipment by air in the U.S.

Cassettes and Disk:
- No additional charge in the U.S.
- $1.50 each foreign airmail

OSBORNE/McGraw-Hill ✓149
630 Bancroft Way, Dept. K7
Berkeley, California 94710
(415) 548-2805 · TWX 910-366-7277

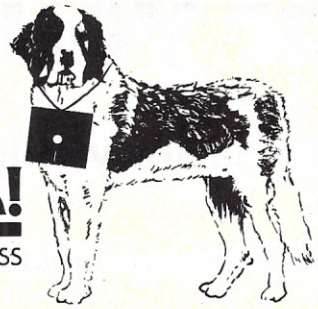
Name: _____
Address: _____
City: _____
State: _____ ZIP: _____
Phone: _____

☐ VISA ☐ Master Card

Credit Card No.: _____

1110

✓Reader Service—see page 226



WE DELIVER!

Osborne Business Software

Before you buy the programs that your company is going to depend on for its accounting, ask the following questions:

Do I get the source code? (Don't settle for less. You cannot make the smallest change without it.)

Is it well documented? (The Osborne documentation is the best.)

Is it fully supported? (If not, why not? What are they afraid of?)

The Osborne system is the industry standard accounting package, with literally thousands of users. We offer an enhanced version of that package that will run on most systems without recompiling.

CRT INDEPENDENCE. The original programs were designed to run on a Hazeltine terminal. To use a different CRT, you had to modify and test two modules — and recompile every program! With the Vandata package, you simply pick your CRT from a menu and run.

FILE/DRIVE MAP. The original package had all data files on the same drive as the programs. Ours allows you to dynamically specify the drive assigned to each file. In fact, you can change the drive assignments whenever you wish, to accommodate expanded file sizes or new hardware — all without recompiling!

INTEGRATION. The original AR and AP systems had to be changed and recompiled to feed journal entries to GL. Our installation program eliminates this hassle. It simply asks you if you want the systems integrated, and what your special account numbers are.

SPEED. The original programs used a binary search to access the GL account file. We use an enhanced technique that greatly cuts down on disk accesses, thus speeding up account lookups significantly in the GL, AR and AP systems.

BUGS. We have corrected a number of bugs in the original programs. If you find a bug in our programs, we'll fix it — and send you a $20 reward! Our users are sent bug fixes in source form.

MORE! We have made many minor enhancements, and fixed many minor problems. We are committed to the ongoing support of our package. Vandata has been an independent software supplier for over seven years. Quality and support are our way of doing business.

General Ledger with Cash Journal	$95
Accounts Receivable	$95
Accounts Payable	$95
Payroll with Cost Accounting	$95
• **All Four Packages (GL, AR, AP, PR)**	**$295**
Magic Wand (Super Word Processor!!)	$345
Pearl Level III (best prog. tool available)	$645
CBASIC-2	$110
TRS-80® MOD II CP/M® 2.2 (Pickles & Trout)	$185
H89/Z89 CP/M® 2.2 (Magnolia Microsystems)	**$249**

Formats: Std. 8", 5" NorthStar DD, TRS-80 MOD II tm, H89/Z89. Manuals for GL, AR/AP, and PR are not included in price — add $20 per manual desired (AR/AP are in one manual). CP/M® and CBASIC-2 required to run accounting software. Users must sign licensing agreement. *Dealer inquiries invited.*

To order call: **(206) 542-8370**

or write: **VANDATA** ✓158

17541 Stone Avenue North

Seattle, WA 98133

VISA

— CP/M® is a registered trademark of Digital Research.
TRS-80® is a registered trademark of Radio Shack, Inc.

master charge

Listing 3 continued.

```
303     4D      8,3                     R       8,3
304     4G      8,3     1G      4
305     4D      8,3
306     3B      8,3
307     3G      8,3     3D      4       2F#     4
308     3B      8,3
309     4C#     8,3
310     4D      2       3A      2       3F#     2
311     3B      4       3G#     4       3D      4
312     4C      2       3A      2       3E      2
313     4C      4       3A      4       3F      4
314     3B      -4      3A      4       2D      4
315     3B      8       3D      4       1B      4
316     4C      16
317     4D      16
318     3B      4       3G      4       2E      4
319     3A      8,3     1A      4
320     4C      8,3
321     3B      8,3
322     4C      8,3     2A      4,3     2F      4
323     4E      8,3
324     4D      8,3     2G#     8,3
325     4D      8,3     2A      4,3     2F#     4
326     4F      8,3
327     4E      8,3     2B      8,3
328     4E      8,3     3C      4       2C      4
329     4A      8,3
330     4G#     8,3
331     4A      8,3     2A      4       2F      4
332     4E      8,3
333     4C      8,3
334     3A      8,3     3C      4       2E      4
335     3B      8,3
336     4C      8,3
337     4F      8,3     2A      4,3     2D      4
338     4E      8,3
339     4D      8,3     2G      8,3
340     4C      8,3     2A      4       2D#     4
341     3B      8,3
342     3A      8,3
343     3E      8,3     2B      4,3     2E      4
344     3A      8,3
345     3G#     8,3     3D      8,3
346     VOLUME  0       VOLUME  0       VOLUME  0
347     4C      2       3A      2       3E      2
348     4D      4       3G      4       3D      4
349     4E      2       3G      4       3C      4
350                     4C      4       2A      4
351     4E      4       3G      4       3C      4
352     4D      -4      3F      4       2A      2
353     4D      8       3A      4
354     4E      16
355     4F      16
356     4D      4       3G      4       2B      4
357     4C      4       3G      4       2C      4
358     4G      8,3     2E      4
359     4E      8,3
360     4C      8,3
361     3G      8,3     3E      4,3     2C      4
362     3A      8,3
363     3A#     8,3     3D      8,3
364     3A      8,3     3C      4       2F      4
365     4C      8,3
366     3B      8,3
367     4C      8,3     2F      4       2D      4
368     3A      8,3
369     3F      8,3
370     3D      8,3     2B      4,3     2G      4
371     3E      8,3
372     3F      8,3     3D      8,3
373     3E      8,3     3C      4,3     2C      4
374     3C      8,3
375     3D      8,3     2G      8,3
376     3E      8,3     3C      4,3
377     3G      8,3
378     3F#     8,3     2C      8,3
379     3G      8,3     3D      4,3     1B      4,3
380     3B      8,3
381     3A      8,3     3F#     8,3     2D      8,3
382     3B      2       3G      2       3D      2
383     4C      4       3G      4       3E      4
384     4D      2       3G      2       3D      2
385     4D      4       3G      4
386     4C      4       3C      4       3G      8
387                                     3F#     8
388     3B      2       3G      2       3D      4
389                                     3E      4
390     3A      8,3     2A      4,3     2D      4
391     3D      8,3
392     3E      8,3     3C#     8,3
393     3F#     8,3     3D      4,3     2D      4,3
394     3A      8,3
395     3G      8,3     2D      8,3     1D      8,3
396     3A      8,3     2D      4,3     1D      4,3
397     4C      8,3
398     3B      8,3     2D      8,3     1D      8,3
399     4C      8,3     2D      -4      1D      -4
400     3A      8,3
401     3F#     8,3
402     3D      8,3     2D      4,3     1D      4,3
403     3F#     8,3
404     3A      8,3     2D      8,3
405     4C      8,3     2D      4,3
406     3B      8,3
407     3A      8,3     2D      8,3
408     3B      2       3G      2       3D      2
409     4C      4       3G      4       3E      4
410     4D      2       3G      2       3D      2
411     3B      4       3G      4       3E      4
412     3A      8       3E      4       3C      8
```

More →

Listing 3 continued.

```
413     3B    16
414     4C    16
415     3A    2     3F#   8     3D    8
416                 3E    8     2B    8
417                 3F#   4     3C    4
418     3G    8.3   R     4     1G    -2.5
419     3B    8.3
420     4D    8.3
421     4G    8.3   R     4.3
422     4D    8.3
423     3B    8.3   2G    8.3
424     3G    8.3   2D    4.3
425     3B    8.3
426     4D    8.3   2G    8.3
427     4F    8.3   2B    4.3   1G    -2.5
428     4D    8.3
429     3B    8.3   R     8.3
430     3G    8.3   R     4.3
431     3B    8.3
432     4D    8.3   2G    8.3
433     4E    8.3   2E    4.3
434     4C    8.3
435     3F    8.3   2C    8.3
436     3F#   8.3   2A    -4    1G    4
437     3A    8.3
438     4C    8.3
439     4D    8.3   2A    4.3   1G    -2
440     3B    8.3
441     3G    8.3   3D    8.3
442     3E    8.3   2B    4.3
443     3G    8.3
444     3B    8.3   3E    8.3
445     4C    8.3   2E    4.3   1G    2.5
446     3A    8.3
447     3F#   8.3   2A    8.3
448     3D    8.3   2F#   4
449     3F#   8.3
450     3A    8.3
451     4C    8.3   3F#   4.3
452     3B    8.3
453     3A    8.3   3D    8.3
454     3B    8.3   3G    4     1G    4
455     3G    8.3
456     3A    8.3
457     3B    8.3   3D    4     2G    4.3
458     4D    8.3
459     4C    8.3                 2F#   8.3
460     4C    8.3   2G    4.3   2E    4
461     4E    8.3
462     4D    8.3   2A    8.3
463     4D    8.3   2B    4     1B    4
464     4G    8.3
465     4F#   8.3
466     4G    8.3   2B    4     2E    4
467     4D    8.3
468     3B    8.3
469     3G    8.3   3E    4.3   1E    4
470     3A    8.3
471     3B    8.3   3D    8.3
472     4C    8.3   2A    4.3   1A    4
473     4D    8.3
474     4E    8.3   2F#   8.3
475     4D    8.3   2G    4.3   1B    4
476     4C    8.3
477     3B    8.3   2D    8.3
478     3A    8.3   2E    4.3   2C    4
479     3B    8.3
480     3G    8.3   2B    8.3
481     3F#   8.3   2A    4     2D    4
482     3G    8.3
483     3A    8.3
484     3D    8.3   2A    4     2F#   4
485     3F#   8.3
486     3A    8.3
487     4C    8.3   2A    4.3   2D    4
488     3B    8.3
489     3A    8.3   2F#   8.3
490     3B    8.3   3D    4     2G    4
491     3G    8.3
492     3A    8.3
493     3B    8.3   2G    4.3   2E    4
494     4D    8.3
495     4C    8.3   2F#   8.3
496     4C    8.3   2G    4.3   2C    4
497     4E    8.3
498     4D    8.3   2A    8.3
499     4D    8.3   2B    4     1B    4
500     4G    8.3
501     4F#   8.3
502     4G    8.3   2B    4     2E    4
503     4D    8.3
504     3B    8.3
505     3G    8.3   2B    4     2D    4
506     3A    8.3
507     3B    8.3
508     3E    8.3   2G    4.3   2C    4
509     4D    8.3
510     4C    8.3   2F#   8.3
511     3B    8.3   2G    4     2C#   4
512     3A    8.3
513     3G    8.3
514     3D    8.3   2A    4.3   2D    4
515     3G    8.3
516     3F#   8.3   3C    8.3
517     3G    2.5   3D    2.5   2B    2.5
518
519
520
```


APPLE — JACK

the graphics & games people

New!

Super Starbase Gunner



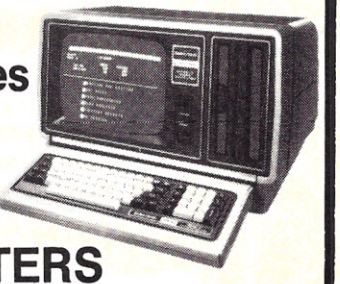
$19.95 DISK **$19.95 DISK**

Most shoot-em-up target games are 2-D shoot across the screen type, and quite frankly there is a glut of inferior ones. A need for a new approach exists, such as fast 3-D HIRES simulations with clever and complex challenges. How about shooting into the screen, into 3-D space, where the target is mathematically many feet behind the screen surface? How about computer intelligent targets that shoot back and use strategy and learn? How about all this and the best attributes of the more popular games? Let's include high score, 10 levels of play, snappy sound effects, colorful explosions and real time graphics. Why not go all the way and have a three dimensional gunsight? A real space battle simulation... Nah... no one would believe it or could even write it. Right?
WRONG!! WE HAVE IT... and it is SUPER STARBASE GUNNER. We are very excited about this product because it is all the things we wish we had and didn't. And you can have it now with this introductory offer.

SUPER STARBASE GUNNER DISK... $19.95 48K with APPLESOFT ROM

AVAILABLE FROM YOUR DEALER OR DIRECT FROM
APPLE—JACK, BOX 51, CHERRY VALLEY, MA 01611
✓314 (INQUIRIES INVITED)

If you're looking for the best prices in the U.S.A. on TRS-80® MICROCOMPUTERS



We are consistently offering the TRS-80 line at savings **up to 20%** which means you can save $150 to $1500 by buying directly from Computer Discount of America.

Our savings are as big on all TRS-80 systems, hardware, accessories, and software, **and,** most models are in stock for immediate delivery (usually within 7-10 days).

TRS-80 Model I, Model II, Model III, Pocket Computer, Color Computer, ATARI Model 400, and Model 800 — we have them all! They are brand new, in factory-sealed cartons, and carry a full factory warranty.

Our TRS-80 computers are pure Radio Shack Factory built — no add-on, untested memory chips from us!

So, if you're looking for the **best prices in the U.S.A., for microcomputers, and accessories . . . CALL TOLL FREE: 800-526-5313**

✓120

Computer Discount of America™

Computer Discount of America, West Milford Mall West Milford, N. J. 07480 201-728-8080.

NO TAX ON OUT-OF-STATE SHIPMENTS.

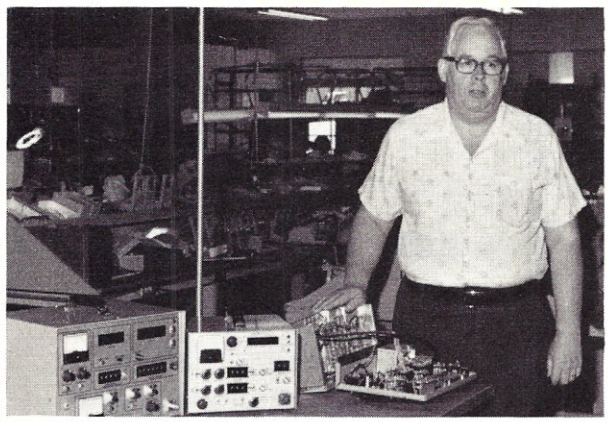
MasterCard VISA

AUTHORIZED **TRS-80®** DEALER

✓Reader Service—see page 226

MSI APPLICATION NOTES

MATTERS OF CHOICE FOR MANUFACTURING SYSTEMS



Don Ludlum, President and Founder of Ludlum Measurements, Inc. is shown with several of the Radiation Detection Products which are manufactured by the company. Ludlum Measurements, Inc. received the Texas Governor's Industrial Expansion Award in 1975.

THE COMPANY:
LUDLUM MEASUREMENTS, INC.
SWEETWATER, TEXAS

Ludlum Measurements, Inc. was organized in 1962 for the design and manufacture of proprietary radiation detection safety instrumentation. The development and use of radiation sources has moved far beyond X-Ray machines and this new growth has required the development of more sophisticated methods of measuring radiation. From these new applications has developed the need for products which increase the level of nuclear safety. Products were developed by Ludlum Measurements for monitoring nuclear power generating plants, nuclear gauging and servicing applications, nuclear medicine research, energy conservation and research, oil field tubing inspection needs, and many areas of environmental control. Ludlum Measurements has grown from a small sales volume and workforce to a multi-million dollar company employing over 80 people. This growth has created jobs, provided training, and contributed to the overall economic growth of the area. For this contribution the company received the Texas Governor's Industrial Expansion Award in 1975.

"This growth has not been without its problems, particularly in a manufacturing company. The increased sales and labor force meant new challenges for planning and control of the operation," Don Ludlum, Founder and President comments.



The modern production facility at Ludlum Measurements, Inc. employs approximately eighty people. With many different production work orders active at any given time, and many items entering and leaving the stock room, requires the MSI computer system for effective inventory management and control.



"The requirements for increased information obviously lead many companies to consider computerization. The consideration of a computer for a manufacturing company is many times stimulated more by sheer growth than anything else. Coping with increased buying levels, projecting component demands, scheduling production runs, all become larger more complex tasks. We even had a service bureau for some four years, but the costs kept getting higher and we had special problems requiring manufacturing oriented software different than the service bureau could offer."

"We considered IBM and NCR because of name and reputation, but found very quickly that making the right choice was more than a matter of the right name or even price for that matter. We needed an approach that would meet OUR needs. We did a thorough search and we think we made a reasonable judgment of the systems on the market and chose MSI. Based upon the product, software and support, we are glad we chose MSI."

The production of many different models of radiation detection instrumentation requires an inventory of several thousand individual items and subassemblies.

"REAL WORLD" MANUFACTURING ISSUES

Selecting an inventory computer system today involves the evaluation of many different system elements. While the capital costs have come down dramatically, the decision is still very critical because of the tremendous value of OUR information stored and handled by the system. We found several issues to be key to our decision to buy the MSI system.

TIME LAGS - not having the information when you need it. Often the cause of stock shortages and untold production delays. Some of the features we needed were:

- On-line data base with interactive file management
- Immediate file updating as parts are received from vendors or drawn for production

MANUFACTURING INEFFICIENCIES - production scheduling, materials planning, not knowing the optimum production lot size, incomplete job costing, all impair production efficiency. We wanted the following as a way of avoiding these problems:

- Manufacturing forecasting
- Reorder lists-by part number, vendor, etc.
- Job costing functions
- Where used reports, bill of materials explosions, substitution info.
- Production pick lists

INVESTMENT MANAGEMENT - ordering only what you need from real time information. Maintaining proper inventory controls means increased inventory turns on smaller dollar level ..... in all better Return On Investment.

To meet these objectives we needed:

- Monitoring of inventory on hand, even by location
- Current investment dollars and units
- Complete transaction files and audit trails
- Purchase order files showing quoted price, delivery, and backorder information.
- Complete history files for each inventory item showing delivery and utilization data for every item

COST ACCOUNTING - a profitable production operation can only be achieved by careful monitoring of production costs, both material as well as labor. We therefore wanted the following system capabilities:

- A Bill of Materials program with complete materials, labor, and overhead cost breakdown.
- A job costing feature which associated all inventory withdrawals with the appropriate job number
- Monthly job cost analysis reporting
- Payroll programs with labor job cost analysis

SUPPORT - all systems need support or service at one point or another. Making sure it is available is important. After all Sweetwater, Texas is not New York. We considered it very important that MSI offered:

- Automatic program enhancement availability
- Full service support
- Modem communications with MSI to provide On-line system diagnostics and software support.

OUR DECISION - MSI

THE IMPACT - The use of computers is better understood by business every day. They save time, make more information available, and usually improve the quality of that information. These all relate to the basics of business planning, implementation and control. **The MSI system and personnel delivered for us.**



Small business is free to choose many options. The Strategic Issues of the 1980's will be making the right choices from ever increasing alternatives. We have the products - Hardware, Software, Service and we have the EXPERIENCE, over ten years in the field.

Consider MSI, evaluate us, and we think you'll buy from us - over 3000 have!

If you would like to know how an MSI computer system can help you make your business more profitable, call or write, Midwest Scientific Instruments, 220 W. Cedar, Olathe, KS 66061, 800-255-6638, Telex 42525(MSI A OLAT).

MSI ..... Helping to make your business run better.

This PET program demonstrates the utility of nested subroutines. You'll have fun with it, too.

Scramble

By Edward Rager

Scramble is a word manipulation game designed to help you at Scrabble, anagrams or scrambled word puzzles. More importantly for programmers, it illustrates how to let nested subroutines take a lot of the work out of programming.

Scramble is designed to run on the Commodore PET, but should be adaptable to any system with string-handling capabilities.

The program takes a word of from three to six letters and displays all possible combinations of these letters on the screen. The number of combinations is found by taking the factorial of the number of letters. For three letters it is the 3 factorial (3!), or $1 \times 2 \times 3 = 6$ (Table 1). For four letters (Table 2) it is 4!: $1 \times 2 \times 3 \times 4 = 24$. Five letters have 120 combinations, and there are 720 possibilities for six letters.

Forty-four words at a time can be displayed on the screen, in four columns of 11 double-spaced rows.

If your only interest is in using this program, then this is the place to stop. Read on, however, if you want to see how laziness can pay off in programming.

How It Works

The word you input for processing is W$. If it is three letters, it is sent to line 3000, where the word is now sent to subroutine 3500 as A3$. Any word sent to subroutine 3500 must go as A3$. This allows any three-letter word to be designated A3$ and sent to subroutine 3500 for processing.

As you will see later, this flexibility lets the program call on subroutine 3500 120 times with just one user input of a six-letter word. Subroutine 3500 divides A3$ into three individual letters (A$, B$ and C$) and puts them back together in all six possible combinations.

If the user inputs a four-letter word, it goes to line 4000, where it is called A4$ and is sent to subroutine 4500. Here the first letter of A4$ is split from the other three. The three are labeled A3$ and sent to subroutine 3500 to be rearranged into six possible combinations. When they return they are sent to subroutine 4900, where they are rejoined with the first letter, which had been held back. Then the second letter of A4$ is held back while the other three are juggled in subroutine 3500. This is repeated until each of the four letters has been kept back and then reunited with the six combinations of the other three, making 24 possible arrangements.

A five-letter word goes to subroutine 5500 as A5$. Four letters of A5$ are sent to subroutine 4500 as A4$, and three letters of A4$ are sent to subroutine 3500 as A3$. These subroutines call on one another until all combinations have been made. To process a five-letter word subroutine 5500 calls subroutine 4500 five times and subroutine 4500 calls subroutine 3500 20 times.

All the subroutines are used to process a six-letter word. Subroutine 3500 is called 120 times. The six-letter words are handled differently from the others, in that not all 720 combinations are saved. It isn't necessary since they don't need to be passed on to a higher subroutine; anyway, an 8K PET would run out of

TAP
TPA
ATP
APT
PTA
PAT

Table 1. Combinations for three letters.

STOP	STPO	SOTP	SOPT
SPTO	SPOT	TSOP	TSPO
TOSP	TOPS	TPSO	TPOS
OSTP	OSPT	OTSP	OTPS
OPST	OPTS	PSTO	PSOT
PTSO	PTOS	POST	POTS

Table 2. Combinations for four letters.

Edward Rager, 9360 Tasmania Ave., Baton Rouge, LA 70810.

Listing 1.

```
SCRAMBLE  BY EDWARD RAGER
 100 DIM A4$(24),A5$(120),A6$(120)
 120 :
 150 OPEN 1,0,1  :  REM  THIS ALLOWS AN
 160 REM  INPUT#1 TO BE USED FOR INPUT
 170 :
 200 PRINT "●SCRAMBLE REARRANGES THE SPE
LLING OF"
 210 PRINT "↓WORDS AND LISTS ALL COMBINA
TIONS OF THE"
 220 PRINT "↓LETTERS. THE WORDS MUST BE
FROM 3 TO 6"
 230 PRINT "↓LETTERS LONG."
 232 PRINT "↓↓TO STOP FROGRAM PREMATUREL
Y TYPE 'STOP'"
 234 PRINT "↓INSTEAD OF 'OK'"
 240 PRINT "↓↓TYPE THE WORD TO BE REARRA
NGED "; : INPUT#1,W$ : PRINT
 248 :
 250 REM  W$ IS THE WORD TO BE JUGGLED
 252 :
 260 L=LEN(W$) : ON L GOTO 300,300,3000,
4000,5000,6000,300
 300 PRINT "↓↓THE WORD MUST BE 3,4,5,OR
6 LETTERS LONG"
 310 GOTO 240
2800 :
2820 :
3000 A3$=W$    :  GOSUB 3500
3100 PRINT"●"
3110 :
3120 FOR I=1 TO 6
3140 : PRINT A3$(I)
3150 : PRINT
3160 NEXT I
3180 GOTO 8000
3200 :
3220 :
3400 REM  SUB 3500 MAKES ALL POSSIBLE
3420 REM  REARRANGEMENTS OF 3 LETTER
3440 REM  WORD A3$.
3460 :
3500 A$=LEFT$(A3$,1) : B$=MID$(A3$,2,1)
3520 C$=RIGHT$(A3$,1):  A3$(1)=A$+B$+C$
3540 A3$(2)=A$+C$+B$ :  A3$(3)=B$+A$+C$
3560 A3$(4)=B$+C$+A$ :  A3$(5)=C$+A$+B$
3580 A3$(6)=C$+B$+A$ :  RETURN
3900 :
3920 :
4000 A4$=W$    :  GOSUB 4500
4020 PRINT "●" :  T=0
4100 FOR I=1 TO 24
4110 : T=T+1
4120 : PRINT A4$(I),
4140 : IF T=4 THEN T=0 : PRINT
4160 NEXT I
4180 GOTO 8000
4200 :
4210 :
4400 REM  SUB 4500 KEEPS BACK ONE
4420 REM  LETTER AND SENDS THE OTHER 3
4440 REM  TO SUB 3500 FOR REARRANGEMENT
4460 REM  IT DOES THIS FOR EACH OF THE
4470 REM  4 LETTERS.
4480 :
4500 D$=LEFT$(A4$,1) : E$=RIGHT$(A4$,3)
4520 A3$=E$ : GOSUB 3500
4540 I1=1 : I2=6 : GOSUB 4900
4560 D$=MID$(A4$,2,1) : E$=LEFT$(A4$,1)
+RIGHT$(A4$,2)
4580 A3$=E$ : GOSUB 3500
4600 I1=7 : I2=12 : GOSUB 4900
4620 D$=MID$(A4$,3,1) : E$=LEFT$(A4$,2)
+RIGHT$(A4$,1)
4640 A3$=E$ : GOSUB 3500
4660 I1=13 : I2=18 : GOSUB 4900
4700 D$=RIGHT$(A4$,1) : E$=LEFT$(A4$,3)
4720 A3$=E$ : GOSUB 3500
4740 I1=19 : I2=24 : GOSUB 4900
4800 RETURN
4820 :
4830 REM  SUB 4900 REJOINS THE HELD-
4840 REM  BACK LETTER WITH THE OTHER
4850 REM  3 FROM SUB 3500.
4860 :
4900 J=0
4910 FOR I=I1 TO I2
4920 : J=J+1
4940 : A4$(I)=D$+A3$(J)
4960 NEXT I
4980 RETURN
4990 :
5000 A5$=W$ : GOSUB 5500
5020 T=0 : II=0 : PRINT "●"
5050 REM  PRINTOUT WILL LIST 11 LINES
5060 REM  OF 4 WORDS EACH ON SCREEN
5100 FOR I=1 TO 120
5120 : T=T+1 : PRINT A5$(I),
5140 : IF T=4 THEN T=0 : II=II+1 :PRINT
5160 : IF II<>11 THEN 5180
5170 : PRINT "TYPE  OK  TO CONTINUE ";
: INPUT#1,B$
5175 : GOSUB 9000 : PRINT :T=0 : II=0
5177 : PRINT "●"
5180 NEXT I
5200 GOTO 8000
5220 :
5230 :
5400 REM  SUB 5500 KEEPS BACK ONE
5420 REM  LETTER AND SENDS THE OTHER 4
5440 REM  TO SUB 4500 FOR REARRANGEMENT
5460 REM  IT DOES THIS FOR EACH OF THE
5470 REM  5 LETTERS.
5480 :
5500 G$=LEFT$(A5$,1) : H$=RIGHT$(A5$,4)
5510 A4$=H$:GOSUB 4500 : I1=1:I2=24:GOS
UB 5900
5530 G$=MID$(A5$,2,1) : H$=LEFT$(A5$,1)
+RIGHT$(A5$,3)
5540 A4$=H$ : GOSUB 4500 : I1=25 : I2=4
8 : GOSUB 5900
5560 G$=MID$(A5$,3,1) : H$=LEFT$(A5$,2)
+RIGHT$(A5$,2)
5570 A4$=H$ : GOSUB 4500
5580 I1=49 : I2=72 : GOSUB 5900
5590 G$=MID$(A5$,4,1) : H$=LEFT$(A5$,3)
+RIGHT$(A5$,1)
5600 A4$=H$ : GOSUB 4500
5610 I1=73 : I2=96 : GOSUB 5900
5620 G$=RIGHT$(A5$,1) : H$=LEFT$(A5$,4)
5630 A4$=H$ : GOSUB 4500
5640 I1=97 : I2=120 : GOSUB 5900
5650 RETURN
5660 :
5830 REM  SUB 5900 REJOINS THE HELD-
5840 REM  BACK LETTER WITH THE OTHER
5850 REM  4 FROM SUB 4500.
5860 :
5900 J=0
5910 FOR I=I1 TO I2
5920 : J=J+1 : A5$(I)=G$+A4$(J)
5940 NEXT I
5960 RETURN
5970 :
6000 A6$=W$ : GOSUB 6500 : GOTO 8000
6100 :
6120 :
6400 REM  SUB 6500 KEEPS BACK ONE
6420 REM  LETTER AND SENDS THE OTHER 5
6440 REM  TO SUB 5500 FOR REARRANGEMENT
6460 REM  IT DOES THIS FOR EACH OF THE
6470 REM  6 LETTERS.
6480 :
6500 M$=LEFT$(A6$,1) : N$=RIGHT$(A6$,5)
6510 A5$=N$ : GOSUB 5500 : GOSUB 6900
6530 M$=MID$(A6$,2,1) : N$=LEFT$(A6$,1)
+RIGHT$(A6$,4)
6540 A5$=N$ : GOSUB 5500 : GOSUB 6900
6560 M$=MID$(A6$,3,1) : N$=LEFT$(A6$,2)
+RIGHT$(A6$,3)
6570 A5$=N$ : GOSUB 5500 : GOSUB 6900
6590 M$=MID$(A6$,4,1) : N$=LEFT$(A6$,3)
+RIGHT$(A6$,2)
6600 A5$=N$ : GOSUB 5500 : GOSUB 6900
6620 M$=MID$(A6$,5,1) : N$=LEFT$(A6$,4)
+RIGHT$(A6$,1)
6630 A5$=N$ : GOSUB 5500 : GOSUB 6900
6650 M$=RIGHT$(A6$,1) : N$=LEFT$(A6$,5)
6660 A5$=N$ : GOSUB 5500 : GOSUB 6900
6680 RETURN
6800 :
6830 REM  SUB 6900 REJOINS THE HELD-
6840 REM  BACK LETTER WITH THE OTHER
6850 REM  5 FROM SUB 5500.
6860 :
6900 T=0   :   II=0    :    PRINT "●"
6910 FOR K=1 TO 120
6920 : T=T+1 : A$=M$+A5$(K) : PRINT A$,
6940 : IF T=4 THEN T=0 : II=II+1 : PRIN
T
6960 : IF II<>11 THEN 6980
6970 : PRINT "TYPE  OK  TO CONTINUE ",
: INPUT#1,B$
6975 : GOSUB 9000 : PRINT : T=0 : II=0
6977 : PRINT "●"
6980 NEXT K
6985 PRINT "TYPE  OK  TO CONTINUE "; :
INPUT#1,B$
6987 GOSUB 9000
6990 RETURN
7000 :
7020 :
8000 PRINT "↓↓TYPE  1  TO CONTINUE, 2
TO END"
8020 INPUT W : IF W=1 THEN 240
8040 END
8100 :
8120 :
9000 IF B$="STOP" THEN 8040
9020 RETURN
READY.
```

memory. Instead, only 120 are saved at a time. These 120 memory locations are written over after they have been printed on the screen.

So How's That Easy?

By going back and forth between all the subroutines, the computer executes approximately 3300 statements to process a six-letter word. If you wanted to write the program for maximum computer efficiency, you could have the program divide the word into its six individual letters and then go through the 720 statements that represented each possible combination. This means the computer could probably get away with only 750 executions, which is much better than 3300.

Keep in mind, however, that you are the one typing in these 750 statements to save your computer a few seconds. With the subroutine method you can get by with only about 150 statements and can process three-, four- and five-letter words as well. You paid a lot of money for the unit. You might as well let it do most of the work.

Many parts of this program are similar. Some programmers do this because it makes it easier to debug; others do it because it makes it easier to follow the program; some because if one part works, chances are they'll all work. I do it because I'm lazy.

For instance, lines 5570 and 5600 are exactly the same. Using the PET's editing features you only need to list line 5570, edit the line number to 5600 and hit the return key. Line 5570 isn't affected, and line 5600 has been written. Line 5580 needs only a few modifications to produce line 5610. The REM statements preceding subroutines 5500 and 5900 are only slightly different from those explaining subroutines 4500 and 4900, or even 3500 and 3900. Even the numbers aren't hard to change.

Naturally, this has to be planned before you start to key in your statements. Also, this type of editing requires concentration. I list the statements frequently to be sure I'm doing it right.

Is It Worth It?

If you've read this far because you're lazy too, you might be wondering if the program is worth the time it takes to type it in.

Well, it is fun, and it certainly makes short work of the scrambled word games in the newspaper's puz-

Variables:

A3$(6)	one of six possible rearrangements of a three-letter word
A4$(24)	one of 24 possible rearrangements of a four-letter word
A5$(120)	one of 120 possible rearrangements of a five-letter word
A6$(120)	one of 720 possible rearrangements of a six-letter word
W$	word to be juggled
L	number of letters in the word to be juggled
A3$	a three-letter word to be juggled in subroutine 3500
A4$	a four-letter word to be juggled in subroutine 4500
A5$	a five-letter word to be juggled in subroutine 5500
A6$	a six-letter word to be juggled in subroutine 6500
A$	first letter of a three-letter word to be juggled in subroutine 3500
B$	second letter of a three-letter word to be juggled in subroutine 3500
C$	third letter of a three-letter word to be juggled in subroutine 3500
D$	one letter of a four-letter word kept back in subroutine 4500. The other three go to subroutine 3500
E$	three letters sent from subroutine 4500 to subroutine 3500
G$	one letter kept back in subroutine 5500 while the other four go to subroutine 4500
H$	four letters sent from subroutine 5500 to subroutine 4500
M$	one letter kept back in subroutine 6500 while the other five go to subroutine 5500
N$	five letters sent from subroutine 6500 to subroutine 5500
I1	lower limit in a FOR-NEXT loop
I2	upper limit in a FOR-NEXT loop
T	=1 to 4; the number of words printed across the screen
II	=1 to 11; the number of rows of words
J	subscript of letters returning from rearrangement in a lower subroutine
W	a number input to END or CONTINUE

Graphics:

•	clear screen
↓	cursor down

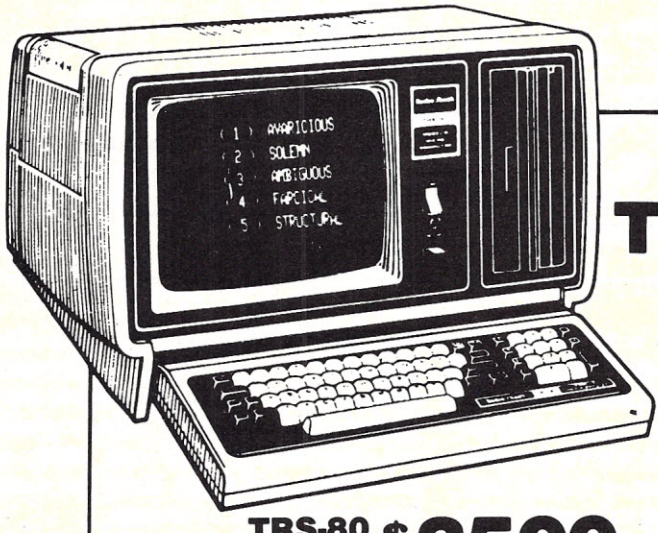
Table 3. Symbols.

zle section. However, I doubt anyone would let you use a computer against them at Scrabble.

The biggest value in this program is for those who have never used nested subroutines. By adding your own statements, you can trace the action of the program. 3510 PRINT "SUB 3500" will let you know each time subroutine 3500 is called. 3510 S3 = S3 + 1 will keep count of how many times it is used. Your own imagination will let you come up with more examples.

Acknowledgements

One good idea in programming is to borrow good ideas from others. Scramble opens file 1 and uses INPUT#1 instead of INPUT for user response to the PET's request for input. This was used by Carol Ascolillo and Nancy Schwartz in their article "Cover Up" (*Microcomputing*, August 1979, p. 26). It keeps the program from ending prematurely if the RETURN key is hit with no input. The program listing uses the concept of prettyprinting as explained by Wallace Kendall's article "Prettyprinting with Microsoft BASIC" (*Microcomputing*, May 1979, p. 80).■

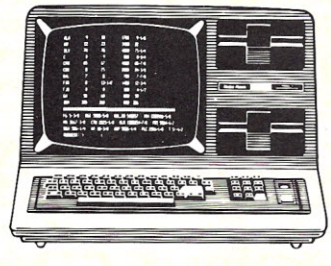


Radio Shack® DEALER

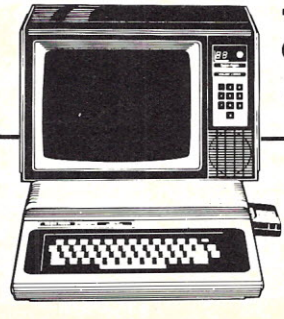
TRS-80™ DISCOUNT

☐ NO OUT-OF-STATE TAX
☐ NO SHIPPING COSTS

TRS-80 MODEL II 64K $3500
PACKS ENOUGH DATA HANDLING POWER FOR MANY SMALL BUSINESSES.



TRS-80 MODEL III 32K-2 DISKS
$2100
NEW PERSONAL COMPUTER... REAL-TIME CLOCK, SHARPER CRT IMAGES AND FASTER LOADING CASSETTES



TRS-80 COLOR COMPUTER OR VIDEO $339 each
A LOW COST, COLOR COMPUTER FOR PERSONAL BUSINESS OR ENTERTAINMENT

CERTIFIED CHECKS
CASHIERS CHECKS
OR CREDIT CARDS
MasterCard VISA

PERRY OIL & GAS INC. ✓266
137 NORTH MAIN STREET, PERRY, MICH. 48872
PHONE (517) 625-4161

WARRANTIES HONORED BY ALL RADIO SHACKS • *T.M. TANDY CORP.

THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™* MICROCOMPUTER

SOFTWARE FOR TRS-80™ OWNERS

H & E COMPUTRONICS INC.

MONTHLY NEWSMAGAZINE FOR TRS-80™ OWNERS

MONTHLY NEWSMAGAZINE
Practical Support For Model I, II & III

- PRACTICAL APPLICATIONS
- BUSINESS
- GAMBLING • GAMES
- EDUCATION
- PERSONAL FINANCE
- BEGINNER'S CORNER
- NEW PRODUCTS
- SOFTWARE EXCHANGE
- MARKET PLACE
- QUESTIONS AND ANSWERS
- PROGRAM PRINTOUTS

. . . . AND MORE

PROGRAMS AND ARTICLES PUBLISHED IN OUR FIRST 12 ISSUES INCLUDE THE FOLLOWING:

- A COMPLETE INCOME TAX PROGRAM (LONG AND SHORT FORM)
- INVENTORY CONTROL
- STOCK MARKET ANALYSIS
- WORD PROCESSING PROGRAM (FOR DISK OR CASSETTE)
- LOWER CASE MODIFICATION FOR YOUR VIDEO MONITOR OR PRINTER
- PAYROLL (FEDERAL TAX WITHHOLDING PROGRAM)
- EXTEND 16-DIGIT ACCURACY TO TRS-80™ FUNCTIONS (SUCH AS SQUARE ROOTS AND TRIGONOMETRIC FUNCTIONS)
- NEW DISK DRIVES FOR YOUR TRS-80™
- PRINTER OPTIONS AVAILABLE FOR YOUR TRS-80™
- A HORSE SELECTION SYSTEM***ARITHMETIC TEACHER
- COMPLETE MAILING LIST PROGRAMS (BOTH FOR DISK OR CASSETTE SEQUENTIAL AND RANDOM ACCESS)
- RANDOM SAMPLING***BAR GRAPH
- CHECKBOOK MAINTENANCE PROGRAM
- LEVEL II UPDATES***LEVEL II INDEX
- CREDIT CARD INFORMATION STORAGE FILE
- BEGINNER'S GUIDE TO MACHINE LANGUAGE AND ASSEMBLY LANGUAGE
- LINE RENUMBERING
- AND CASSETTE TIPS, PROGRAM HINTS, LATEST PRODUCTS COMING SOON (GENERAL LEDGER, ACCOUNTS PAYABLE AND RECEIVABLE, FORTRAN 80, FINANCIAL APPLICATIONS PACKAGE, PROGRAMS FOR HOMEOWNERS, MERGE TWO PROGRAMS, STATISTICAL AND MATHEMATICAL PROGRAMS (BOTH ELEMENTARY AND ADVANCED) . . . AND

* TRS-80™ IS A TRADEMARK OF TANDY CORP.

FREE*

WORD PROCESSING PROGRAM For writing letters, text, mailing lists, etc., with each new subscriptions or renewal.
LEVEL II RAM TEST Checks random access memory to ensure that all memory locations are working properly.
DATA MANAGEMENT SYSTEM Complete file management for your TRS-80™.
CLEANUP Fast action Maze Game.
ADVENTURE Adventure #0 by Scott Adams (From Adventureland International).

FREE

*** All programs are supplied on cassette (add $3 for Diskette Version - add $5 for modified Mod-II Version).**

SEND FOR OUR NEW 48 PAGE SOFTWARE CATALOG (INCLUDING LISTINGS OF HUNDREDS OF TRS-80™ PROGRAMS AVAILABLE ON CASSETTE AND DISKETTE). $2.00 OR **FREE** WITH EACH SUBSCRIPTIONS OR SAMPLE ISSUE.

✓6

H & E COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

master charge

24 HOUR ORDER LINE
(914) 425-1535

VISA

NEW TOLL-FREE ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

ONE YEAR SUBSCRIPTION $24 .....
TWO YEAR SUBSCRIPTION $48 .....
SAMPLE OF LATEST ISSUE $ 4 .....
START MY SUBSCRIPTION WITH ISSUE .....
(#1 - July 1978 • #7 - January 1979 • #12 - June 1979 • #18 - January 1980)
NEW SUBSCRIPTION ..... RENEWAL .....

CREDIT CARD NUMBER _____ EXP. DATE _____

SIGNATURE _____

NAME _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

*** ADD $6 YEAR (CANADA, MEXICO) - ADD $12 YEAR AIR MAIL - OUTSIDE OF U.S.A., CANADA & MEXICO ***

✓ Reader Service—see page 226

This installment contains a miscellany of short, but no less significant, SWTP thoughts.

Thoughts on the SWTP Computer System

By Peter A. Stark

Several readers have asked for a tutorial on 6800 machine- and assembly-language programming. Recent installments of the Kilobaud Klassroom (November and December 1980), which features a construction series using the 6802 processor, cover machine- and assembly-language fundamentals. Since the 6802 has the same language as the 6800, you will find that almost all of the material there fits your SWTP system directly.

Serial Port Hand-Shaking

We normally think of serial interfaces as operating open loop—that is, sending out data to a printer or terminal regardless of whether this device is ready to receive that data or not. This is the normal state of affairs.

But there are many new printers that have a serial port capable of running at a higher baud rate than the printer can really print. In this case running open loop is almost guaranteed to lose characters. We therefore need some way of closing the loop—that is, providing a feedback signal from the printer back to the computer to slow down data when the printer cannot keep up.

Here is a typical case. There are several new printers in the $600–$900 range rated at about 120 characters per second. You would therefore think that 1200 baud would be an ideal speed, since this represents exactly 120 characters per second. Such is not the case.

In many cases, the print head makes a complete pass from the left margin to the right margin (or back, in the case of printers which print bi-directionally), regardless of how many characters are to be printed on that line. If the paper is 120 characters wide (to keep it simple), then that pass takes one second, regardless of how many characters are actually printed.

If the printed line has 120 characters, then they will all be printed in one second. But if the line has only ten characters, then this will still take one second, and hence the printing speed is only ten characters per second. Here, then, is a difference between dumb printers and smart printers—the smart printer will move its print head only part way across the paper if the printed line is short, and thereby achieve a faster transfer rate. Really good printers—generally in the $1300–$1500 range—will have a fast slew speed so that the print head will speed up when moving from one place to another, and may even have a fast up-down paper movement speed.

In any case, what baud rate should we use to feed a dumb printer? Even if we use a baud rate sending just ten characters per second, then lines longer than ten characters will be sent slow enough, but shorter lines will still give us problems.

Most such printers provide an internal FIFO (first in, first out) buffer of anywhere from 256 to 2048 bytes, which provides temporary storage in case the input data rate gets slightly ahead of the actual printing speed. Nevertheless, on long printouts of short lines, it is still possible to lose characters.

Thus the need for closing the loop. This turns out to be very simple when using the MP-S ACIA-type interface.

Most such serial printers provide a hand-shaking output called BUSY, READY, or something like that, which indicates when the printer cannot accept data. For example, the MPI 88T printer I worked with provides an output called BUSY, which is low (near 0 V) when the printer is ready for more data, but goes high (near +5 V) when its buffer fills up and cannot accept more.

The 6850 ACIA, on the other hand, has a Clear to Send ($\overline{\text{CTS}}$) input on pin 24, which permits the ACIA to output serial data when low, but halts output when high. All we have to do is connect the printer's BUSY signal to pin 24 of the ACIA.

The actual connection is just a bit tougher. On the MP-S board, ACIA pins 23 and 24 are both grounded, and it is difficult to break the foil leading to pin 24 to open up that pin. I solved that by bending pin 24 out of the socket, slipping a single Molex pin over that IC pin and soldering a thin jumper to the tip of the Molex pin. This makes the entire change reversible if needed. I used the index pin on the connector at the top of the MP-S board to bring the BUSY signal to the board.

Once this is done, you can run the printer and interface at 1200 or even 9600 baud, and never lose data. The computer will output rapidly to the printer until it fills up the buffer, and then slow down to precisely the right

Peter A. Stark (PO Box 209, Mt. Kisco, NY 10549) is a professor of electrical and computer technology at Queensborough Community College, City University of New York, Bayside, New York. He has contributed many pieces to Microcomputing *including his Kilobaud Klassroom articles and the SWTP series.*

speed to keep the buffer full, while the printer runs at its maximum speed.

One potential problem is that MOS ICs such as the ACIA are prone to static electricity damage. Connecting pin 24 of the ACIA right out like this may lead to potential problems if static electricity gets to this lead. A safer solution would have been to buffer this input with a TTL device (such as two inverters in a 74LS04, back to back). Being in a hurry, I chose not to do this, but it is something to keep in mind.

9600 Baud

We've mentioned this once before—the SWTP motherboard only carries up to 1200 baud clock to the interfaces, but baud rates up to 9600 are available at the MC14411 clock generator on the CPU board. To make the switch, simply cut the 150 baud output at the 14411 (which you will never use anyway) and substitute the baud rate you want. This will place the required baud rate on the 150-baud line properly buffered on the CPU board, and you need just connect to the 150-baud line on the interface.

Converting an MP-C to an MP-S

Many users have an MP-C PIA-type serial interface left over from their MIKBUG days, having replaced it with an MP-S. Except for the fact that an MP-C uses a PIA, whereas the MP-S interface uses an ACIA, the two interfaces are very similar to each other. With just a little work (and about $5 for a new 6850 ACIA and some thin wire), you can update an older MP-C interface into an MP-S as follows:

1. If the ICs on your MP-C board are in sockets, then unplug IC1, IC3, IC4 and IC6, discard and go to step 2. If the ICs are not in sockets, then a little preparatory work is needed. IC3, IC4 and IC6 will not be used; thus, you can cut their pins with a pair of diagonal cutters, and simply discard each IC, leaving the pins soldered in place. IC1, the PIA, will also be discarded, but an ACIA socket has to be installed in its place; thus, it has to be removed neatly. The easiest method is to cut all its pins, take the IC off and then carefully—using a vacuum-type solder-sucker—remove the solder from each pin and pull out the pin. After the PIA has been removed, install a 24-pin socket for the ACIA in the PIA position, being sure that pin 1 of the socket is in the hole formerly occupied by PIA pin 6.

2. Remove the C jumper.

3. Next, we will modify some of the wiring around the PIA (IC1) position to accommodate the ACIA. Use a single-edge razor blade or X-acto knife to cut the following lands. The best method is to make two cuts about 1/16 inch apart (close to the IC1 socket), and then use the tip of a small soldering iron to pry up and remove the piece of copper between the lands. Then clean the cut area with a Q-Tip and some alcohol.

4. On top of the board, cut the land leading to PIA pin 34.

5. On the bottom of the board, cut the lands leading to PIA pins 9, 24 and 35, close to the socket.

6. Now use some thin wire (the type used for wire-wrapping is best) to make the following connections on the bottom of the printed circuit board:

PIA pin 6 to PIA pin 1 (ground)
PIA pin 7 to IC5 pin 8 (received data)
PIA pin 8 to IC3 pin 1 (clock)
PIA pin 9 to PIA pin 8 (clock)
PIA pin 10 to PIA pin 19 (RTS)
PIA pin 11 to IC5 pin 13 (transmitted data)
PIA pin 12 to PIA pin 38 ($\overline{IRQ}$)
PIA pin 13 to PIA pin 15 (CS0 to +5 volts)
PIA pin 14 to PIA pin 23 (CS2 to I/O Select)
PIA pin 15 to PIA pin 17 (CS1 to +5 volts)
PIA pin 16 to PIA pin 36 (RS0)
PIA pin 17 to PIA pin 20 (Vcc)
PIA pin 24 to PIA pin 21 (R/$\overline{W}$)
PIA pin 34 to ground
PIA pin 35 to ground

7. Now plug the ACIA into its socket, taking care to position it so its pin 1 is in the hole formerly occupied by pin 6 of the PIA.

This completes conversion of the MP-C board to the MP-S circuit. All connections between the card and the terminal remain the same as before.

Though the ACIA can work at higher baud rates, the MP-C printed-circuit board only has positions for 110- or 300-baud jumpers. If you want to operate at higher rates, you will have to connect the baud rate jumper directly to the Molex connector on the bottom of the MP-C board. Look at the board layout for the motherboard to see which pin has which baud rate signal on it.

The 6875 Clock Generator

One of our readers mentioned that Motorola has stopped producing the 6875 clock generator used on the MP-A2 CPU board. If you anticipate needing one, you should make the rounds of Motorola distributors now, while some may still be on the shelves.

This IC is also used in the Heath ET-3400 trainer; it may be available from Heath as a last resort if you need it (part number 443-840). After that, if your 6875 goes, it may be necessary to replace the entire clock circuit with the one used on the MP-A board, or replace the 6800 with a 6802 and change a few connections (most of the 6802 pins are positioned the same as those of the 6800).

CT-82 Modifications

SWTP has released a new control ROM ($30) which fixes up some previous bugs and also adds new functions. This should be a very worthwhile addition to an excellent terminal.

SWTP BASIC 3.0 under Flex 2.0

Until now, the only BASIC available for Flex 2.0 has been TSC BASIC and TSC Extended BASIC. This makes the conversion from MiniFlex

BPS SOFTWARE

FOR OHIO SCIENTIFIC USERS

BPSORT for DMS

- **MACHINE CODE** for high-speed sorting
- **BASIC** language program for establishing sort parameters
- Files of any length can be sorted
- Floppies and hard disks are supported
- Up to five keys can be specified
- Ascending and descending keys are processed simultaneously
- "Header" records can be skipped if present
- Requires **OS-65U**

BPSORT $124.00

EASY TO USE AND EXTREMELY FAST. A FILE OF **TWENTY-THOUSAND** BYTES CAN BE SORTED IN **LESS** THAN **10 SECONDS.**

Order C.O.D. Master Charge or Visa from ✓168

Honders Inc
57 North Street
Middletown, NY 10940
Telephone (914) 343-4880

to Flex 2.0 quite an expensive proposition, especially since the standard TSC BASIC has too little accuracy for financial calculations, while the Extended BASIC requires almost 20K just for the interpreter.

An article in the July 1980 issue of *68 Micro Journal* by Richard G. Cagle (Applevalley Day School, 11103 Sagepark Lane, Houston, TX 77089) suggests an alternative.

Richard's article shows how to modify SWTP Disk BASIC version 3.0 (which was originally supplied with SWTP disk systems as part of the miniFlex package) to run under Flex 2.0. He developed the modification to permit some business software he is marketing to run under Flex 2.0 with minimal modifications.

Though SWTP BASICs are much, much slower than TSC BASICs, this modification should be of interest to those who would like to switch to Flex 2.0 but don't want to invest heavily in a new BASIC.

BASIC Differences

TSC BASICs handle null strings slightly differently from older BASICs.

First, TSC BASIC assumes that the null string is the same as a single space. For example, if you try running

```
IF "" = " " THEN PRINT "SAME"
```

you will get the printout SAME in TSC BASIC, but not in SWTP BASICs.

Second, in SWTP BASIC you can enter a null string during an INPUT statement. For example, in response to

```
INPUT A$
```

you can just hit a carriage return, and SWTP BASIC will make A$ equal to a null. TSC BASIC does not permit that—you must actually enter one or more characters. This is unnerving if your program contains something like

```
INPUT "HIT RETURN TO CONTINUE",A$
```

TSC BASIC will refuse to accept just a return.

TSC BASICs also insert extra spaces before numbers; this sometimes causes problems.

An important fact to remember when using sequential disk files is that TSC BASICs do not automatically insert delimiters between fields. For example, suppose that we have the strings A$ = "ABC", and B$ = "DEF". If we write these to a disk file in SWTP BASIC, the file will have the characters

ABC,DEF carriage return.

BASIC inserts a comma between the two strings, and a carriage return at the end. But TSC BASIC omits the comma. Thus, if we read this file back into A$ and B$, SWTP BASICs will have A$ equal to ABC, and B$ again equal to DEF; TSC BASIC, on the other hand, will have ABCDEF in A$ and nothing in B$.

This is important to remember if you are transferring a program from an earlier BASIC to TSC BASIC.

The Abort Switch

Have you ever looked at a Motorola Exorciser system? This is a development system for products using Motorola processors. One interesting aspect of this computer is that on the front panel, right next to the reset switch, is another switch labelled abort. What does it do?

The abort button generates an NMI interrupt. When this occurs, the Exorciser aborts whatever program it is currently executing, stores register contents on the stack, prints the register dump on the terminal and returns to the monitor.

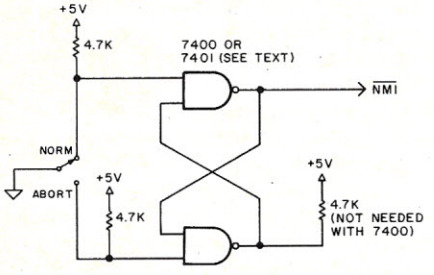


Fig. 1. Abort switch debouncing circuit.

In many ways this is like a reset. But the register dump also tells us where the computer was and what it was doing when it was interrupted. After a program is aborted, it can then be modified and restarted, just as if it had just hit a breakpoint. This is an extremely worthwhile feature—how many times has your computer gone into never-never-land leaving you wondering where it was? With the abort button you would have known.

Adding an abort switch to the SWTP system is not that hard; it involves some hardware and some software.

Connecting a push-button switch from the NMI line on the bus to ground would be good enough to generate an NMI, but switch bounce would cause several successive NMIs to be generated; this would overflow the stack and cause problems. Thus, we need to debounce the switch.

Fig. 1 shows a debouncing circuit which requires an SPDT push button. A 7400 NAND gate package (without the output resistor) can be used if you have no other sources of NMI interrupts; otherwise, a 7401 open-collector NAND gate (with resistor) is required to leave the NMI line available for other uses.

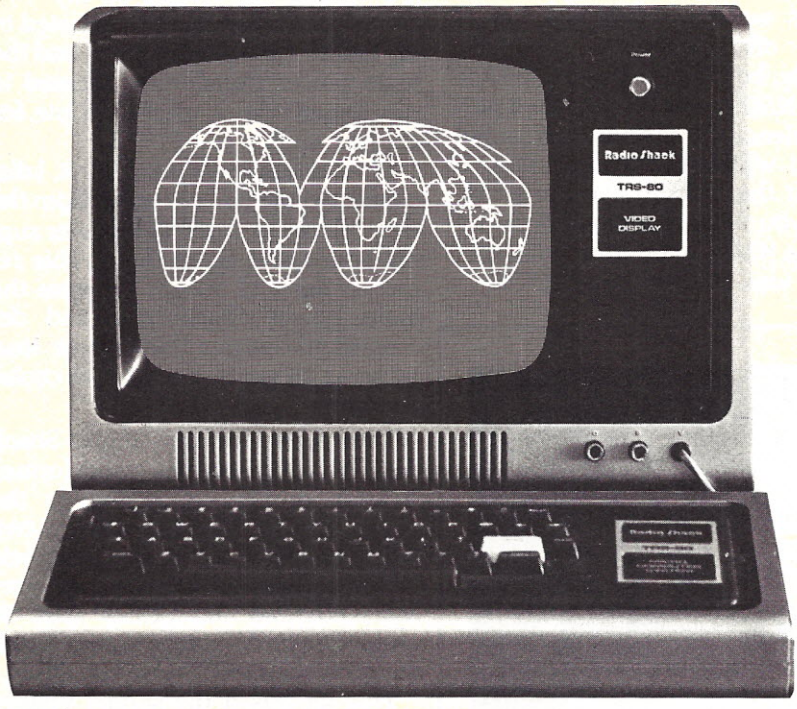
The quickest software fix to implement the abort switch is to use the monitor's M command to read out the address from the SWI vector (location A012) and place the same address into the NMI vector (location A006). In the case of SWTBUG, place the address E123 into A006; with other monitors the address may be different. (Of course, you must remember to do this before executing a program you may want to abort later. If you haven't prepared for it, then you cannot abort later.) With this change, pushing the abort will act the same as encountering a breakpoint in the program, resulting in a return to monitor and a register printout.

Though this modification will work, it has two drawbacks. First, the program counter (PC) address dumped will be incorrect, and second, under some conditions it may not be possible to restart the program.

On a breakpoint, the PC address in the stack points to the next instruction after the SWI (3F) which caused the breakpoint. SWTBUG subtracts 1 from this, so that the PC address in the register dump points to the breakpoint location, rather than past it.

On an NMI or abort, the PC address in the stack points to the next instruction after the one which was executing when the interrupt occurred. After SWTBUG subtracts 1 from this, the displayed PC address will point to the last byte of the last instruction. This may be the instruction code itself (in one-byte instructions), or the second or third bytes of this instruction. Thus, some interpretation of the register dump is required.

The other problem is this—when SWTBUG finishes the register dump, it checks whether a breakpoint was in effect. If it was, then it keeps the current stack pointer; otherwise, it resets the stack pointer to A042. Thus, it may change the stack pointer after an abort NMI, and then you cannot continue the aborted program. This is normally not much of a prob-



CompuServe's information service.

A world of information available. Right now.

If you have a personal computer—or a computer terminal — CompuServe can bring a world of information into your home or small business.

CompuServe
CompuServe is a major computer services company that has been serving top industrial and governmental clients for more than a decade. Now we're also applying our extensive computing capacity to the delivery of information services to your personal computer.

The Information Service
This exciting service is available in more than 250 cities between 6 p.m. and 5 a.m. weekdays, all day weekends and most holidays. Cost? Only $5.00 per hour billed in minutes. All you need is a 300 baud modem, and our complete information service is only a local phone call away.

Welcome to CompuServe's information service.

- *News. Weather. Sports.* Major regional newspapers. Plus international news services.
- *Finance. MicroQuote.* Updates and historical information on stocks, bonds and commodities.
- *Entertainment.* Theatre, book, movie and restaurant reviews. Plus opera, symphony, ballet, dance, museums, galleries...
- *Electronic Mail.* Create, edit, send and receive messages from any other CompuServe user... nationwide.
- *Home & Educational Reference Service.* Anything you want to know... from encyclopedia information to household tips.
- *CompuServe User Information.* In case you need technical help... and information on new services as they become available.
- *MicroNET.* For the computer hobbyist. Software Exchange, line printer art gallery, challenging games, programming languages, word processing, business & educational programs... and much, much more.

And this is just the beginning. CompuServe is continually adding to its list of available services. The world of electronic information isn't coming tomorrow. It's here today.

CompuServe is Available at Radio Shack® Stores
Your local Radio Shack® Store Sells CompuServe's information service. There are more than 6,000 Radio Shack® Stores and Dealers nationwide. Check with the outlet nearest you.

Radio Shack is a division of Tandy Corporation.

CompuServe

Information Service Division ✓147
5000 Arlington Centre Blvd.
Columbus, Ohio 43220
(614) 457-8600

✓ Reader Service—see page 226

lem, since we are usually more interested in knowing what was going on, rather than restarting.

As an aside, the HUMBUG monitor we described in past installments has the correct NMI instructions to provide the correct PC address during an abort.

Unfortunately, the abort switch will sometimes not work. If a program bombs sufficiently that it erases all of memory, then it may also erase the NMI vector at A006; in that case a reset is the only alternative. Placing the NMI vector directly into the monitor ROM would be an alternative, but this would prevent the use of NMI for other purposes.

Finally, both Flex 2.0 and SSB DOS use the NMI vector for their own purposes. Hence the abort switch cannot be used while they are running. If you exit the DOS to execute a program, you should remember to restore the NMI vector prior to using it, since it was changed by the DOS.



Power Supply Modifications

After adding nine 2708 EPROMs to my system, the voltage on my +12 and −12 V power supplies started to sag below the desirable level, and the main power transformer seemed to run hotter than it used to. Time for another update.

My solution was simple. First, I disconnected the two red wires from the transformer to the SWTP power supply board and taped them. This removed the ±12 V supplies from the main power transformer and decreased the power transformer load by some 25 watts, resulting in cooler operation.

Then I connected a Radio Shack 25.2 V center-tapped transformer (catalog number 273-1512) to the power supply board, with the two red wires going to the two terminals which earlier had the two red wires removed, and the yellow wire to ground (120 V going to the black wires, of course).

This increased the supply voltage from +12 and −12 V to about 14–15 V, which provides a better safety margin.

The only thing to watch out for is that some boards require +12 or −12 V, and do not use a regulator because they count on the supply voltage being very close to that value. These boards must be modified by installing a 7812 regulator for +12 V, or a 7912 regulator for −12 V. (Note, however, that the MP-C and MP-S boards do not require an exact voltage, and the regulator is not needed even with 14–16 V.)

6809-Based Bulletin Board

What may be the first 6809-based community bulletin board system (CBBS) was started this past summer by a 6800/6809 computer dealer in Pennsylvania.

As Tom Quay of Lehigh Computer Works (1132-2 Tilghman, Allentown, PA 18102) put it, the purpose of the bulletin board was to serve as a communications medium between his customers. 6800/6809 users can share ideas, find out about the latest software and hardware, place inquiries or orders with the store or receive answers to their questions.

The interesting thing about the system is that it uses no special software. The system uses an auto-answer modem which takes care of answering and hanging up the phone automatically, without involving the

computer at all.

The system is essentially a standard SWTP system with two disks, running TSC's Flex. Only three disk utilities are on the disk—CAT, BUILD and LIST. Moreover, a minor modification to Flex has disabled the GET and MON commands. Thus, anyone familiar with Flex can use the system without any further instructions.

Since only the three functions are available, there is little chance of a user abusing the system. It is possible to get a catalog of disk files on either drive, to build a new text file or list an existing file, but not to return to the monitor, delete files or take over control of the system. Tom reads all files every day or so, and simply removes any files no longer needed. Altogether, it is a simple system that could be implemented by almost any 6800 or 6809 owner.

In the first few days of operation, Tom did discover a few problems which had to be solved. For example, if a user asked for a catalog of drive 3 (on a two-drive system), Flex would hang up; obviously the system had to be patched to prevent accessing nonexistent drives. But on the whole, the entire idea is quite novel.

If you want to access the system, the phone number is 215-437-0556, which is used by the store staff during the day. The CBBS is operational from 9 PM to 8 AM.

Video Status

There are several video boards available for SS-50 systems:

- Gimix, Inc. (1337 West 37th Place, Chicago, IL 60609), has a standard video board and a high-resolution graphics card set.
- Thomas Instrumentation (168 Eighth Street, Avalon, NJ 08202) has an inexpensive video board, available assembled or as a bare board.
- Percom Data Co. (211 N. Kirby, Garland, TX 75042) has a video board called the Electric Window, as well as a color video board called the Electric Crayon (which is intended for the TRS-80).
- Johnson Micro Computer (2607 E. Charleston, Las Vegas, NV 89104) does not make a video board as such, but they make an adapter board for a CT-64 terminal which connects it to an SS-50 SWTP computer so that the terminal's screen memory becomes directly addressable by the computer.
- F&D Associates (1210 Todd Road, New Plymouth, OH 45654) has three video boards—two for black and white text and/or graphics and one for color. They sell bare boards and instructions for building your own.

There are various differences between the boards in terms of both the hardware they use and the software needed to drive them.

Some boards (for example, the Johnson and Thomas boards) use a minimum of hardware. The boards have 1K of RAM, which represents 1K of characters to be displayed, generally in 16 lines of 64 characters. Each memory location corresponds to a particular place on the screen; put an ASCII character there (with an STA in machine language or a POKE in BASIC) and the character appears in the corresponding place on the screen. This approach is very simple, but it requires additional software to keep track of characters. For example, when the bottom line on the screen is full, it is necessary to erase the top line, move all remaining lines up one position and then erase the bottom line in preparation for new text. This is called scrolling, and must be done by software on these simple boards.

A MAJOR NEW YORK BANK
INVITES YOU TO BANK AT HOME
...By Personal Computer
Our system talks with yours. A program diskette provides
access to the bank for:
. bill paying
. account transfers
. balance inquiry
. record keeping
Software requires 48K bytes of memory and one disk drive.
This is a pilot program. For more information, please terminate
this message by sending in the form below.

NAME_____

ADDRESS_____CITY_____STATE_____ZIP_____

TELEPHONE NO._____
Name and type of system_____
Do you have communications capability?_____
If not, are you planning for it?_____
MAIL FORM TO: Home Banking System
P.O. Box 721
Radio City Station
New York, New York 10101 ↙49
KM

Other boards (such as the Gimix and Percom) use an intelligent CRT controller which does most of the scrolling internally. On these boards, the text need not physically be moved inside memory to move one line up on the screen; the controller simply readdresses each line when it reads out the characters being displayed, so that lines appear to move up without actually changing place in memory itself.

The latter approach simplifies the software required to some extent, but it also has a further advantage. When scrolling is done by software, physically moving all characters up by one line in memory takes time. Not only does this slow down the operation of the system, but during this movement the memory is unavailable to the display circuitry (since the computer is using it) and thus we get interference on the screen.

From the above discussion, you might surmise that the hardware approach, using an intelligent controller, is better than the software approach. Actually, there are other factors to be considered. If you want to use the screen to display graphic symbols, you need to know exactly which RAM location corresponds with which spot on the screen; this is difficult to do with those boards where a controller does the scrolling. Moreover, if you want to split the screen into portions, or reserve a line or two for a special status display, then again the controller tries to defeat your efforts.

For this reason, it is sometimes better to defeat the controller on the board and go back to using the software scrolling approach. To illustrate, let's discuss the Percom Electric Window video board and the program of Listing 1.

The Percom board uses the CRT 5027 video timer-controller made by Standard Microsystems Corp. (35 Marcus Blvd., Hauppage, NY 11787). This is a fairly complex circuit which permits a wide variety of formats having from one to 64 lines and one to 200 characters per line. The most convenient display format on the Percom board, however, is 16 lines of 80 characters; a 24-line format is possible, but requires a long-persistence screen to avoid an unpleasant flicker.

In the Percom board, the screen RAM is at locations D800 to DFBF, and the controller registers are at DFC0 through DFCF; addresses DFD0 through DFFF are unused.

When the controller is set up for a 16×80 display, the screen RAM is divided up so that the first 80 locations (D800-D84F) are called line 0, the next 80 locations (D850-D89F) are line 1, and so on, up through locations DCB0-DCFF, which are line 15.

These line numbers, however, do not correspond with the actual lines as seen on the screen; instead, we can specify which of these lines should become the bottom line on the screen by placing that line's number into location DFC6 (called BOTLNE in the program). Thus, if we put 15 (or hex 0F) into BOTLNE, then line 0 will be at the top while line 15 is at the bottom. But if we put 00 into BOTLNE, then line 0 will be at the bottom, and the next line, line 1, will start off at the top. This controller scrolls the screen simply by incrementing BOTLNE by 1, going from 00 through 0F and then back to 00. This rearranges the text lines on the screen without actually moving contents of memory.

To keep track of the cursor—and the location where the next character should go—we have locations DFCD (called CURV) and DFCC (called CURH). These locations keep track of the vertical and horizontal position of the cursor. (There is a slight inconsistency which should be explained—CURH assumes that there is a two-character margin to the left of the screen, so CURH=2 is actually the left-most character on the screen. This explains why the program sets CURH to 2, or subtracts 2 in several places.) Percom video driver software, called WINDEX, normally uses CURV and CURH to position the next character and uses BOTLNE to have the 5027 controller scroll the screen without actually moving screen contents.

As mentioned earlier, the disadvantage of this system is that drawing pictures, or reserving lines for special purposes, is difficult in this kind of a scheme. I devised the program in Listing 1, which is loosely (very loosely) based on Percom's Windex driver. This video driver program uses strictly software to place characters on the screen.

In this scheme, the screen RAM at D800-DCFF strictly corresponds with screen position. D800 is the character at the top left of the screen, D801 is just to its right and so on, all the way to DCFF, which is at the lower right corner. This is achieved by forcing BOTLNE to always equal 0F, so that line 15 is always at the bottom of the screen and never allowed to move. It is therefore possible to poke characters or graphic symbols into the screen RAM, and they will always appear exactly where you place them (unless scrolled later).

Another useful aspect of the program is the use of the variable TOP to define the top of the usable screen memory. TOP is set to D800 during the initialization part of the program, so that normally the entire area from D800 through DCFF is used for the 16-line display. But TOP can be initialized above D800, thereby reserving an area from D800 to TOP so that it is not used by the video driver.

For example, suppose we set TOP equal to D850. The driver will now ignore the first 80 locations of the screen RAM, corresponding to the top line, line 0, on the screen. It will not place characters into this area, nor will it scroll up into it. Now you can put special text or graphics into this area and have it remain even while the rest of the screen is used. Anywhere from 0 to 255 locations can thus be reserved; reserving 80, 160 or 240 will reserve entire lines, while other numbers may reserve just parts of lines.

Such a reserved line on the screen is often called a status display, since it is used to show the status of the system. What kind of status?

Well, to begin with, it can display the time. If you have a complete clock, such as the JPC clock board, you can use interrupts to transfer the

Listing 1. Video board driver program.

```
                    NAM   EW          DRIVER

                    * VIDEO DRIVER FOR PERCOM VIDEO BOARD
                    * LOOSELY BASED ON PERCOM'S "WINDEX" DRIVER
                    * MODIFIED BY PETER A. STARK TO PERMIT
                    * EASY DMA TO SCREEN MEMORY AND TO RESERVE
                    * 0 TO 3 STATUS LINES AT TOP OF SCREEN

                    * VIDEO BOARD REGISTERS
(DCFF)      BOT     EQU   $DCFF       END OF SCREEN MEMORY
```

More →

APPLE PRODUCTS

THIS MONTH'S SPECIALS

APPLE COMPUTER

		Our Price
Apple II Plus 16K	1195.00	995.00
Apple II Plus 48K	1395.00	1099.00
Apple II Disk w/cont 3.3	645.00	549.00
Apple II Disk w/o cont	495.00	469.00
Apple Pascal System	495.00	399.00
Apple Silentype Printer	595.00	529.00
Integer Firmware Card	200.00	179.00
High Speed Serial Card	195.00	169.00
Centronics Parallel Card	225.00	189.00

OLENSKY BROS., INC. ✓130
COMPUTER SALES DIVISION
3763 AIRPORT BLVD. • MOBILE, AL. 36608
205/344-7448
10 AM-6 PM CST

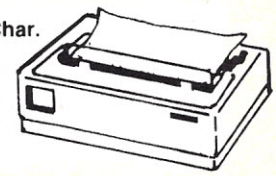
PRINTERS/MONITORS /ACCESSORIES

Microsoft Z-80 Softcard	349.00	299.00
Hayes Micromodem II	379.00	349.00
CCS-7710A Serial Card	159.95	129.00
CCS-7728A Centronics Card	119.95	99.00
CCS-7424A Clock/Calendar	125.00	99.00
Mntn Comp A/D-D/A Card	350.00	329.00
Mntn Comp ROM Plus Card	155.00	139.00
Mntn Comp Filter ROM	55.00	49.00
Mntn Comp Copy ROM	55.00	49.00
M&R Supermod II	29.95	29.00
Smarterm 80 Col Board	360.00	329.00
Sanyo 9 in Monitor	240.00	169.00
Sanyo 12 in Monitor	320.00	289.00
OKI u80 Printer	800.00	595.00
Paper Tiger 460G Printer	1395.00	1249.00

Retail Store Prices May Differ From Mail Order Prices

OKIDATA MICROLINE 80 PRINTER

- Graphics
- 72, 80, 132 Char. Line Width
- Friction or Pin Feed



Okidata Microline 80 Printer. Apple Hi-res graphics print package. Parallel interface and cable.
Special Package Price 999.90 **695.00**

Visicalc and Appleplot Software Packages.
Special Package Price 219.95 **169.00**

16K Ram Set - 1 year warranty
List Price 100.00 **39.95**

NEW... ...AD 200

S-100 A/D and TIMER BOARD

Tecmar's new A/D and Timer Board is designed to meet sophisticated data acquisition needs. The board can accommodate various A/D modules providing options such as 12, 14, or 16 bit accuracy; 100 MHz throughput; variable ranges and gains. It contains a powerful timer circuit (AMD 9513) which can start A/D conversion and can also be used independently for time of day, event counting, frequency shift keying and many other applications.

S-100 TRS-80[1] PET[2] KIM[2] APPLE

A/D

- 12 Bit
- High Speed
- 8 Ch. Differential
- 16 Ch. Single-ended
- Each A/D Board $495

D/A

- 12 Bit
- High Speed
- 4 Channel
- Each D/A Board $395

*TRS-80 or PET expansion board, power supply, and enclosure **$200.***
*Kim expansion board and power supply **$150.***

TECMAR INC. ✓139

TECMAR, INC.
(216) 382-7599

23414 Greenlawn • Cleveland, OH 44122

S-100 BOARDS

Real Time Video Digitizer & Display	$850
8086 CPU W/vectored interrupts	$450
Ram 8Kx16/16Kx8	$395
8086 PROM-I/O	$495
Serial and Parallel I/O	$350
Parallel I/O & Timer	$350
AD 100	$495
AD 200	Call
DA 100	$395

Complete Systems Also available

[1]Reg. Trademark of Tandy Corp.
[2]Reg. Trademark of Commodore

SMALL SOFTWARE SYSTEM ✓231 PRODUCTS FOR THE TRS-80 SMALL SOFTWARE SYSTEM

NEW!

PENMOD - $19.95. Adapts Disk-Pencil to Radio Shack lower case modification. Also adds single page printing and several other new features.

SCRIPMOD - $14.95. Add TRS232 print driver, or add handshake/linefeed control to RS-232-C driver in Radio Shack's SCRIPSIT (disk version only).

WHISTLER: HOME CONTROLLER INTERFACE - $34.95. New hardware product that controls lights, appliances, computer peripherals, darkroom timers and other 115 volt devices anywhere in your house! Software controlled by cassette cable. Use with Sears or BSR Home Control System with ultrasonic option. Assembled, tested, self-contained, and includes Basic software.

UTILITIES

RSM-2: MACHINE LANGUAGE MONITOR FOR 16K TRS-80'S - $26.95
RSM-2D: THREE VERSIONS OF RSM-2 FOR DISK SYSTEMS - 29.95
RSM-2 RELOCATOR: PUT RSM-2/2D ANYWHERE IN MEMORY - 9.95

Machine Language monitors with Z-80 disassembler! HEX and ASCII memory dumps; EDIT, MOVE, EXCHANGE, VERIFY, FILL, ZERO, TEST, or SEARCH memory, read/write SYSTEM tapes, enter BREAKPOINTS, PRINT with TRS232 or Centronics, read/write disk sectors directly! RSM-2 tape loads at top of 16K LEVEL I or II; RSM-2D disk includes 3 versions for 16K, 32K and 48K.

DCV-1: CONVERT SYSTEM PROGRAMS TO DISK FILES -$9.95. Execute Adventure, Air Raid, RSL-1, ESP-1, T-BUG, etc. from disk, even if they interfere with TRSDOS! New version works with TRSDOS 2.3.

BASIC-1P: LEVEL-1 BASIC WITH PRINTING! - $19.95. Run any LEVEL-I BASIC program on your 16K Level-2. PLUS LPRINT and LLIST with our TRS232 or Centronics. Furnished on tape; can be used from disk.

MACHINE LANGUAGE GAMES

AIR RAID, BARRICADE or **RSL-1: - $10.00** each, all 3 for **$25.00**

AIR RAID: A super shooting gallery; our most popular game. Ground based missile launcher shoots high speed aircraft! Hours of fun!

BARRICADE: "BREAKOUT" for the TRS-80! Break through 5 walls with high-speed ball and keyboard controlled paddle! 96 different options!

RSL-1: Enter patterns with repeating keyboard! Save patterns on tape (4 furnished). Play John Conway's LIFE. FAST - about 1 second per generation!

SMALL SYSTEM SOFTWARE P. O. BOX 366 NEWBURY PARK, CA 91320

PROFESSIONAL SOFTWARE

NEW! ELECTRIC PENCIL-IIB FOR MODEL-II. Super Pencil version runs under TRSDOS or CP/M. Automatic centering, dynamic print formatting, single-page printing,etc. Buffered keyboard eliminates missed characters at line ends! Diablo, NEC, Qume versions include bold face print, variable pitch, & more!
TRSDOS PENCIL: Standard printer - $325; Diablo, NEC, Qume (specify) - $350
CP/M PENCIL: Standard printer - $275; Diablo, NEC, Qume (specify) - $300

ELECTRIC PENCIL FOR MODEL-I: TAPE-$99.95, DISK-$150.00. Popular video editor for creating and saving text files. Prints formatted copy with right justification, page titling & numbering, etc. Upper case only, or lower case with modification. Requires at least 16K.

RSMII: ENHANCED RSM MONITOR FOR THE MODEL-II - $39.95. Relocatable version of RSM-2D plus screen editor for modifying either memory or disk sectors in both Hex and ASCII, split screen scrolling, and formatted serial or parallel printing. Sold on self-booting disk; directions to save as TRSDOS file.

CP/M OPERATING SYSTEM: MODEL-I - $145.00; MODEL-II - $170.00. The 8080/Z80 "Software Bus" for TRS-80's. Model-I includes TRS232 and RS-232-C software. Model-II supports single and double density disks, and reads TRSDOS files. Many unique utilities included in both versions!

PRINTER SUPPORT

TRS232 PRINTER INTERFACE - $59.95 Assembled & tested printer interface for RS232 or 20-mil current loop printers. Expansion interface not required. Print from level-II BASIC, CP/M, BASIC-1P, ELECTRIC PENCIL, etc. Standard cassette software included. Add $2.00 for shipping.

TRS232 "FORMATTER" SOFTWARE PACKAGE - $14.95. Adds page and line length control, printer pause, "smart" line termination, etc. to TRS232.

RSM232: Adds RS-232-C capability to RSM-2/2D monitors - $9.95
PEN232: RS-232-C for cassette version Electric Pencil - 9.95
EDT232: TRS232 and RS-232-C for tape version of EDTASM - 9.95

OTHER PRODUCTS FOR THE TRS-80

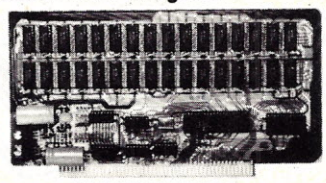
ESP-1: $29.95. Assembler, Editor, Monitor (8080 mnemonics)
LST-1: 8.00. Listing of Level-1 BASIC with some comments

CP/M tm Digital Research, Inc. TRS-80 tm Tandy Corp.
See your dealer or order direct. Calif. Residents add 6% tax

SMALL SYSTEM SOFTWARE P. O. BOX 366 NEWBURY PARK, CA 91320

✓ Reader Service—see page 226

The days of complicated, unreliable, dynamic RAM are gone:



INTRODUCING

JAWS

the ultrabyte memory board

$199.95 (*complete kit with 16K memory*)

Netronics consistently offers innovative products at unbeatable prices. And here we go again — with JAWS, the ultrabyte 64K S100 memory board.

ONE CHIP DOES IT ALL

JAWS solves the problems of dynamic RAM with a state-of-the-art chip from Intel that does it *all*. Intel's single chip 64K dynamic RAM controller eliminates high-current logic parts . . . delay lines . . . massive heat sinks . . . unreliable trick circuits.

REMARKABLE FEATURES OF JAWS

Look what JAWS offers you: Hidden refresh . . . fast performance . . . low power consumption . . . latched data outputs . . . 200 NS 4116 RAMs . . . on-board crystal . . . 8K bank selectable . . . fully socketed . . . solder mask on both sides of board . . . designed for 8080, 8085, and Z80 bus signals . . . works in Explorer, Sol, Horizon, as well as all other well-designed S100 computers.

GIVE YOUR COMPUTER A BIG BYTE OF MEMORY POWER WITH JAWS — SAVE UP TO $90 ON INTRODUCTORY LIMITED-OFFER SPECIAL PRICES!

UNDECIDED? *TRY A WIRED 16K JAWS IN YOUR COMPUTER ON OUR 10-DAY MONEY- BACK OFFER (SPECIFY YOUR COMPUTER).*

CONTINENTAL U.S.A. CREDIT CARD BUYERS OUT SIDE CONNECTICUT CALL

CALL TOLL FREE 800-243-7428

From Connecticut Or For Assistance. (203) 354-9375

NETRONICS RESEARCH & DEVELOPMENT LTD

333 Litchfield Road, New Milford, CT 06776

Please send the items checked below: **KB1**

- ☐ **JAWS 16K RAM kit,** No. 6416, $199.95.*
- ☐ **JAWS 16K RAM fully assembled, tested, burned in,** No. 6416W, $229.95.*
- ☐ **JAWS 32K RAM kit,** No. 6432, (reg. price $329.95), **SPECIAL PRICE $299.95.***
- ☐ **JAWS 32K RAM fully assembled, tested, burned in,** No. 6432W, (reg. price $369.95), **SPECIAL PRICE $339.95.***
- ☐ **JAWS 48K RAM kit,** No. 6448, (reg. price $459.95), **SPECIAL PRICE $399.95.***
- ☐ **JAWS 48K fully assembled, tested, burned in,** No. 6448W, (reg. price $509.95), **SPECIAL PRICE $449.95.***
- ☐ **JAWS 64K RAM kit,** No. 6464, (reg. price $589.95), **SPECIAL PRICE $499.95.***
- ☐ **JAWS 64K RAM fully assembled, tested, burned in,** No. 6464W, (reg. price $649.95), **SPECIAL PRICE $559.95.***
- ☐ **Expansion kit, JAWS 16K RAM module,** to expand any of the above in 16K blocks up to 64K, No. 16EXP $129.95.*

*All prices plus $2 postage and handling. Connecticut residents add sales tax.

Total enclosed: $_____

☐ Personal Check ☐ Money order or Cashiers Check

☐ VISA ☐ MASTER CHARGE (Bank No. ____)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____

State _____ Zip _____

☐ Send me more information

Listing 1 continued.

```
(DFCD)    CURV   EQU   $DFCD     CURSOR LINE REGISTER
(DFCC)    CURH   EQU   $DFCC     CURSOR HORIZONTAL REGISTER
(DFC6)    BOTLNE EQU   $DFC6     BOTTOM LINE

                * OUTCHV - OUTPUT ON VIDEO BOARD
(9000)          ORG   $9000
9000 37   OUTCHV PSH B           SAVE REGISTERS
9001 36          PSH A
9002 FF 9121     STX   SAVEX
                * SEARCH CHARACTER TABLE FOR SPECIAL CASES
9005 CE 90D3     LDX   #CHTABL    POINT AT TABLE
9008 A1 00   TAB CMP A 0,X        LOOK AT NEXT ENTRY
900A 26 04       BNE   TAB1      IF NOT FOUND
900C EE 01       LDX   1,X       FOUND SPECIAL CHAR
900E 6E 00       JMP   0,X       JUMP TO CORRECT ROUTINE
9010 08     TAB1 INX             POINTR AT NEXT ENTRY
9011 08          INX
9012 08          INX
9013 6D 00       TST   0,X       END OF TABLE?
9015 26 F1       BNE   TAB       NO, SO LOOK FOR MORE

                * NOT SPECIAL CHARACTER, SO CONTINUE
9017 85 E0       BIT A #$E0      IS IT CONTROL CHAR?
9019 27 50       BEQ   EXIT      IGNORE IF YES

                * NOW PROCESS PRINTABLE CHARACTER
901B 36          PSH A           SAVE CHARACTER
901C F6 DFCD     LDA B CURV      GET VERT POSITION OF CURSOR
901F CE D800     LDX   #$D800    POINT TO SCREEN MEMORY
9022 FF 911F     STX   POINTR
                * NOW STEP FORWARD 80 BYTES FOR EACH LINE
9025 5A     STEP1 DEC B
9026 2B 0F       BMI   STEP3     QUIT WHEN B<0
9028 B6 9120     LDA A POINTR+1
902B 8B 50       ADD A #80       ADD 80 TO POINTER
902D 24 03       BCC   STEP2
902F 7C 911F     INC   POINTR    INCR ON OVERFLOW
9032 B7 9120 STEP2 STA A POINTR+1
9035 20 EE       BRA   STEP1     AND REPEAT
                * NOW ADD 1 TO POINTER FOR EACH HORIZ CHAR
9037 B6 DFCC STEP3 LDA A CURH    ADD CURSOR HORIZ POSITION
903A BB 9120     ADD A POINTR+1  TO POINTER
903D 24 03       BCC   STEP4
903F 7C 911F     INC   POINTR    INCR ON OVERFLOW
9042 80 02   STEP4 SUB A #2      COMPENSATE FOR LEFT MARGIN...
9044 24 03       BCC   STEP5     ...(PECULIAR TO SMC CONTROLLER)
9046 7A 911F     DEC   POINTR    DECR ON BORROW
9049 B7 9120 STEP5 STA A POINTR+1
                * NOW PLACE CHARACTER ON SCREEN
904C FE 911F     LDX   POINTR
904F 32          PUL A           RESTORE CHARACTER
9050 A7 00       STA A 0,X       PUT IN CORRECT SPOT
                * CHAR IN CORRECT SPOT, UPDATE CURSOR
9052 7C DFCC FF  INC   CURH      MOVE CURSOR RIGHT
9055 B6 DFCC     LDA A CURH      CHECK POSITION
9058 81 51       CMP A #81       PAST END OF LINE?
905A 2F 0F       BLE   EXIT      NO, SO EXIT
                * PAST END OF LINE, SO GO TO NEW LINE
905C 86 02       LDA A #2        MOVE CURSOR TO LEFT MARGIN
905E B7 DFCC     STA A CURH
9061 B6 DFCD LF  LDA A CURV      GET CURSOR VERT POSITION
9064 81 0F       CMP A #$F       BOTTOM OF LINE?
9066 27 09       BEQ   SCROLL    YES, SO GO SCROLL
                * NOT YET AT BOTTOM
9068 7C DFCD     INC   CURV      MOVE CURSOR DOWN 1 LINE
906B FE 9121 EXIT LDX  SAVEX     RESTORE REGISTERS
906E 32          PUL A
906F 33          PUL B
9070 39          RTS             AND EXIT

                * ONCE AT BOTTOM LINE, SCROLL UP 1 LINE
9071 FE 9123 SCROLL LDX  TOP     POINT TO TOP OF USABLE RAM
9074 A6 50   SCROL1 LDA A 80,X
9076 A7 00       STA A 0,X       MOVE 80 LOCS FORWARD
9078 08          INX
9079 8C DCB0     CPX   #BOT-79   DONE SCROLLING?
907C 26 F6       BNE   SCROL1    NO
                * ERASE BOTTOM LINE
907E 86 20   SCROL2 LDA A #$20
9080 A7 00       STA A 0,X
9082 08          INX
9083 8C DD00     CPX   #BOT+1    DONE?
9086 26 F6       BNE   SCROL2    NO
9088 20 E1       BRA   EXIT      AND EXIT

                * ROUTINES FOR SPECIAL CHARACTERS

908A B6 DFCC BS  LDA A CURH      GET HORIZ POSITION
908D 81 02       CMP A #2        AT LEFT MARGIN?
908F 27 DA       BEQ   EXIT      YES, IGNORE
```

More →

time at fixed intervals—1, 60 or 100 times per second—into the status portion of the video RAM. Even if you only have a timer board, such as the SWTP MP-T timer board, the interrupt program can still compute the time by counting up the number of interrupts and display it.

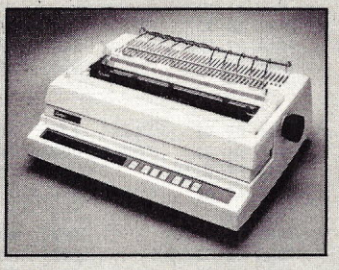
But there are other, more useful, things to display. Most of these essentially need a timer board such as the MP-T to periodically cause interrupts; each time an interrupt occurs, the interrupt service program gets some number from memory, converts it to ASCII and transfers it to some appropriate part of the status line. With care, several different status messages can be displayed in different portions of the line. Some of these might be:

- The contents of the BASIC or editor input buffer, showing a line exactly as it is currently being typed or edited.
- The track and sector currently being accessed by the disk.
- The number of characters read from or written to the disk since some previous time.
- The address of the most recently executed instruction in a machine-language program, or the line number of the most recently executed line in a BASIC program.
- The level—high or low—of one or more I/O lines, or the status of I/O equipment.
- The number of the port or ports currently active.

The possibilities are endless. For example, I was very intrigued recently by the status display of a friend's Alpha Micro computer. The first 77 spaces on that line were devoted to the 77 tracks on his disk drive; at each interrupt, the interrupt software would see which track had most recently been used, and place a period in the corresponding position on the status line. By watching the period move left and right, you could almost see the disk head moving in and out to various tracks.

A similar idea would be to use the first 16 positions for the 16 4K segments of memory, and put a period (or, better yet, a hex digit 0 through F) into the corresponding location to indicate the address of the most recent instruction. You could then observe programs as they wander through memory. I will be implementing this idea and will show how it is done in a future installment. ■

Data Terminals *Fast* ...from MICROMAIL



DIABLO 630

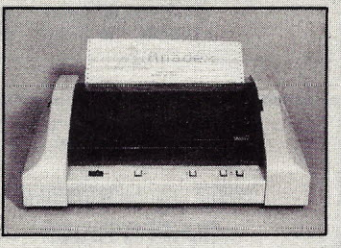
The Diablo Model 630 is a reliable, high quality, full-character serial printer for anyone who is seeking superior print quality at a low cost. This is the first Diablo printer to offer complete interchangeability between metal and plastic print wheels. And the sophisticated and discerning user does not sacrifice print quality to obtain this versatility. Every aspect of the Diablo 630 design has been focused on maintaining outstanding print quality. Terminals also have self-test, extensive internal diagnostics and automatic bidirectional printing.

$1,999.00

Adjustable Forms Tractor — **$200.00**

ANADEX DP-9500/9501

The Anadex Models DP-9500 and DP-9501 Alphanumeric Line Printers are designed for all printer applications, including those requiring high density graphics. Standard features include three standard interfaces (RS 232C, Centronics Parallel, and Current Loop), software selectable print sizes including compressed and expanded print, heavy-duty nine-wire printhead (permits true underlining and descending lower case letters), and fast bi-directional printing. The model 9501 offers slightly higher graphics resolution and a slightly slower print speed than the model 9500.



$1,399.00

PRINTERS		C.R.T.'s		TELEPRINTERS	
ANADEX		**TeleVideo**		**DEC**	
DP 9000	$1299	912C	$ 725	LA 34	$ 969
T.I.		920C	$ 795	LA 34 AA	$1099
810/2	$1599	950	$ 995	**TELETYPE**	
DIABLO		**SOROC**		43	$ 999
1640 RO	$2525	IQ 120	$ 689	**DIABLO**	
1650 RO	$2675	IQ 140	$1099	1640 KSR	$2830
				1650 KSR	$2940



TEC 511

This state-of-the art, microprocessor-controlled terminal offers many advantages over older, dumber video display units. Standard features include five video attributes, conversational or block mode communications, self-test, and an 80 column by 25 line upper/lower case display. The 511 is built by TEC, the nations oldest independent video terminal manufacturer.

Price good through February 28, 1981. — **$599.00**

MICROMAIL 68 II™

MICROMAIL • BOX 3297 • SANTA ANA, CA 92703

(714) 731-4338

To Order: Send check to MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703. Personal or company checks require two weeks to clear. Visa/MasterCard accepted. C.O.D. requires a 15% deposit **Handling:** Add 3% to orders less than $750, 2% to orders $751 - $2,000, 1% to orders over $2,000. NOTE: Handling charges are waived on orders pre-paid in advance by check. **Shipping:** We ship FREIGHT COLLECT via UPS or Motor Freight. Air and Express delivery is available.

Reader Service—see page 226

'68' MICRO JOURNAL™

6800-6809-68000

★ The only ALL **68XX** Computer Magazine.

Foreign Orders—Add:

Air Mail $30.00 /Year Surface $12.00 /Year

1-Year **$18.50** 2 Years **$32.50**

3 Years **$48.50**

OK, PLEASE ENTER MY SUBSCRIPTION

Bill my: M/C ☐ — VISA ☐

Card #_____

Expiration Date_____

For ☐ 1-Yr. ☐ 2 Yrs. ☐ 3 Yrs.

Enclosed: $_____

Name_____

Street_____

City_____

State_____ Zip_____

'68' MICRO JOURNAL™
3018 Hamill Road
HIXSON, TN 37343 ✓132

OSBG T.M.

OFFICIAL SOFTWARE BUYERS GUIDE ✓113

A guide to software for all major hardware systems. Listings of hardware operating systems and the following software: Big 5, Other Business Applications, Games and miscellaneous programs. In excess of 1000 programs.

Send $6.95 to Official Software Buyers Guide, P.O. Box 18278, Reno, Nevada 89511.

Name_____

Type of system used_____

Address_____

City, State, Zip_____

Mailing Date: January 15, 1981

APPLE DISKS

Each Containing Multiple Programs
TRS Programs Available Early '81

BASIC TUTOR SERIES

This series of disks is designed for the novice programmer and for those interested in learning how to program the **APPLE** Computer in **Basic.**

Basic Tutor I — Introduction to programming commands.

Basic Tutor II — Continuation of Tutor I with the introduction of **Graphic Commands** in low and high resolution graphics modes.

Basic Tutor III — Introduction to the study of **Text Files** and the basis for most of the "data processing" of strings and words.

Basic Tutor IV — Studies in some simple methods of creating computer sounds and **music** composition.

Basic Tutor V — This disk includes some of the program studies that have been created by "novice" programmers, and are intended for your use and study.

Basic Tutor VI — Studies in the intermediate level of programming in **Basic.** This disk is intended for your use and study of more "tricks".

Basic Tutor VII — More utility programs to use and for your study.

Astronomy I — Introduction to the study of stars and constellations. High resolution graphics is used to show the constellations you can find in the heavens. The first disk contains 6 programs.

Astronomy II — A continuation of **Astronomy I,** that includes the viewing of the major constellations in the heavens with features shown. Includes 6 programs.

Physics I • Population • Number Race • Class Records Book • Inventory • Accounts • Conversions

All Disks $24.00 Partial listing, ask for our catalog. Pre-paid, add $1.50 Mailing/handling. Guaranteed.

EDUCATIONAL COURSEWARE ✓339

3 Nappa Lane, Westport, CT 06880

Listing 1 continued.

```
9091 7A DFCC          DEC   CURH      MOVE CURSOR LEFT 1
9094 20 D5            BRA   EXIT

9096 B6 DFCD  VT      LDA A CURV      GET VERT POSITION
9099 81 00            CMP A #0        TOP OF SCREEN?
909B 27 CE            BEQ   EXIT      YES, IGNORE
909D 7A DFCD          DEC   CURV      MOVE UP 1 LINE
90A0 20 C9            BRA   EXIT      AND RETURN

90A2 86 02    CR      LDA A #2        SET CURSOR TO LEFT MARGIN
90A4 B7 DFCC          STA A CURH
90A7 20 C2            BRA   EXIT


90A9 8D 0F    CLEAR   BSR   HOMEUP    CLEAR SCREEN
90AB 86 20    ERASE   LDA A #$20      ERASE TO END OF FRAME
90AD FE 9123          LDX   TOP       START AT TOP OF USABLE SCREEN
90B0 A7 00    ERASE1  STA A 0,X       CLEAR NEXT
90B2 08               INX
90B3 8C DD00          CPX   #BOT+1    BOTTOM?
90B6 26 F8            BNE   ERASE1
90B8 20 B1            BRA   EXIT

90BA 86 02    HOMEUP  LDA A #2
90BC B7 DFCC          STA A CURH      SET CURSOR TO LEFT MARGIN
90BF 4F               CLR A           ALLOW FOR 1 OR 2 EMPTY LINES
90C0 F6 9124          LDA B TOP+1
90C3 C0 50    HOME1   SUB B #$50      COMPUTE TOP LINE
90C5 2B 03            BMI   HOME2
90C7 4C               INC A           MOVE DOWN TO NEXT
90C8 20 F9            BRA   HOME1
90CA B7 DFCD  HOME2   STA A CURV      SET CURSOR TO 1ST USABLE LINE
90CD 86 0F            LDA A #$F
90CF B7 DFC6          STA A BOTLNE    DISABLE AUTO SCROLLING
90D2 39               RTS


90D3 08       CHTABL  FCB   $8 BACKSPACE
90D4 90 8A            FDB   BS
90D6 0D               FCB   $D CARRIAGE RETURN
90D7 90 A2            FDB   CR
90D9 0A               FCB   $A LINE FEED
90DA 90 61            FDB   LF
90DC 10               FCB   $10 CLEAR SCREEN?
90DD 90 A9            FDB   CLEAR
90DF 0B               FCB   $B VERTICAL TAB
90E0 90 96            FDB   VT
90E2 0C               FCB   $C NON-DESTRUCTIVE SPACE
90E3 90 52            FDB   FF
90E5 7F               FCB   $7F RUBOUT
90E6 90 6B            FDB   EXIT
90E8 00               FCB   0

              * VINIT - VIDEO INITIALIZATION
90E9 4F       VINIT   CLR A
90EA CE DFC0          LDX   #$DFC0
90ED A7 0A            STA A $A,X      RESET CONTROLLER
90EF A7 0E            STA A $E,X      SET UP TIMING CHAIN
90F1 86 65            LDA A #$65
90F3 A7 00            STA A 0,X       HORIZONTAL LINE COUNT
90F5 86 64            LDA A #$64
90F7 A7 01            STA A 1,X       INTERLACE H SYNC
90F9 86 6D            LDA A #$6D
90FB A7 02            STA A 2,X       ROW SCAN CHAR
90FD 86 8F            LDA A #$8F
90FF A7 03            STA A 3,X       ROW FRAME
9101 86 03            LDA A #$03
9103 A7 04            STA A 4,X       LINE FRAME
9105 86 20            LDA A #$20
9107 A7 05            STA A 5,X       VERT START
9109 86 0F            LDA A #$0F
910B A7 06            STA A 6,X       LAST ROW
910D 4F               CLR A
910E A7 0A            STA A $A,X      RESET CONTROLLER
9110 A7 0E            STA A $E,X      START TIMING CHAIN
9112 86 D8            LDA A #$D8
9114 B7 9123          STA A TOP       SET TOP = D800
9117 7F 9124          CLR   TOP+1
911A 86 10            LDA A #$10      CLEAR SCREEN CODE
911C 7E 9000          JMP   OUTCHV    GO DO IT

              * VIDEO DRIVER STORAGE

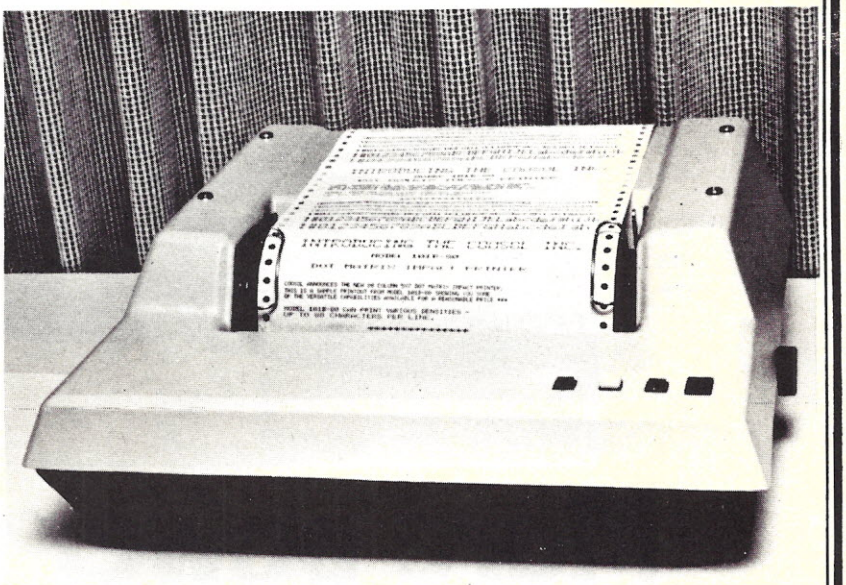
911F          POINTR  RMB   2         POINTER TO CURSOR LOC
9121          SAVEX   RMB   2         TEMP INDEX STORAGE
9123          TOP     RMB   2         TOP OF SCREEN MEMORY

                      END
```

FEATURES INCLUDE:

- Uses Standard Typewriter Ribbon
- Micro Processor Controlled
- Can Operate Continuously—No Thermal Problems (Has an all metal print head)
- 5 x 7 to Larger 10 x 7 and Larger 10 x 14 Dot Matrix Character Generator
- Standard 96 ASCII Character Font
- Upper and Lower Case Printing
- Up to 88 Characters Per Line
- Single Line Print Rate Is 160 CPS
- Average Print Rate Is 60 CPS For Ten Lines
- Graphics Capability With Extended Character Modes
- Programmable With 32 System Level Software Commands
- Standard Parallel and Serial Interface
- Software and Hardware Reset Interface
- Software Line Counting For Paging
- Baudrate Select From 110 to 9600
- Manual Paper Advance
- Manual Selftest and Reset
- Adjustable Tractor Width From 1 to 9½ Inches
- Interfaces with Apple, Atari, OSI, T.I., TRS-80 and the List Goes On

COOSOL DATA LOGGER IMPACT PRINTER



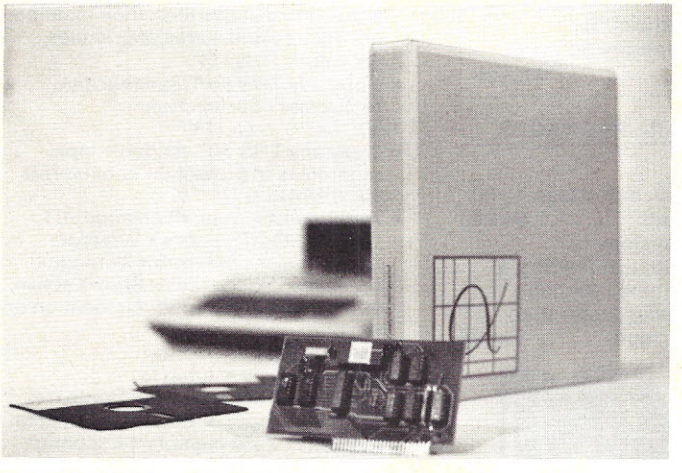
$495 Kit, 101B-80KE $545 Assembled & Tested 101B-80E

✓292

COOSOL, INC. P.O. BOX 743, ANAHEIM, CA 92805 (714) 545-2216 7 Days a Week

FOR THE APPLE :

μSPEED



- *Runs **six** to **sixty** times **faster** than Basic*
- *Programming capabilities well beyond Applesoft*
- *Auxiliary Processor (Am9511) for **fast** Floating Point*
- *High-speed, extended high resolution graphics*
- *Software development time cut in half*
- *Exceptionally compact, compiled code*
- ***Extensible,** structured language to meet **your** needs*
- ***Bonus:** Increased speed Applesoft functions*
- *Requires 48K Apple II or II+, single Disk*

The microSPEED Language System combines the benefits of compiled code and hardware arithmetic processing for the maximum in microcomputing performance. Developed from an extended version of Forth, the System is ideally suited to the serious Apple user.

THE POWERFUL, PAINLESS ALTERNATIVE TO BASIC AND PASCAL.

applied analytics incorporated

5406 Roblee Dr., Suite 701 Upper Marlboro, MD 20870

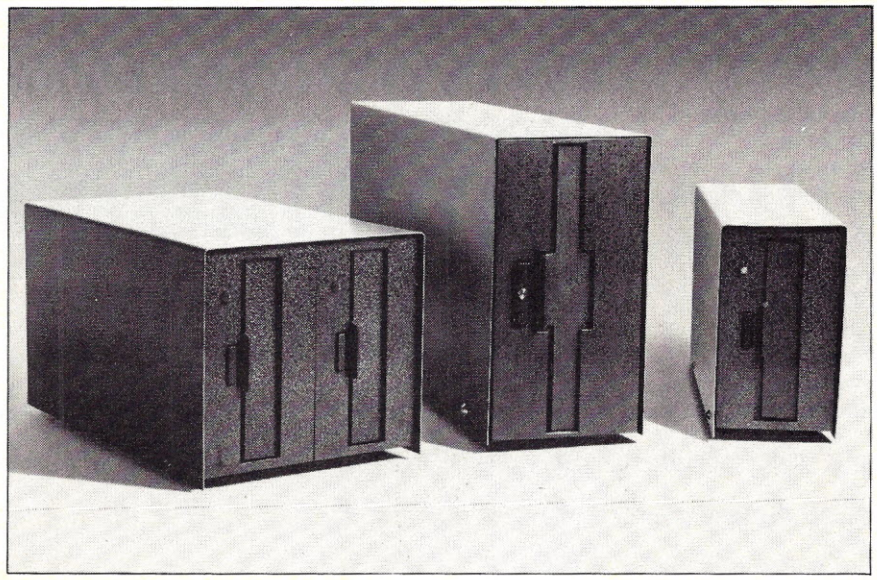
✓134

Please send:
- ☐ Complete System $495.00
- ☐ User's Manual only $35.00
- ☐ Detailed information

Name _____

Address _____

City _____ State _____ Zip _____



More power to you.

Disk drives, hardware and software— now more affordable *and* more available!

The choice is yours
Whether you need professional-looking cases and power supplies, complete disk drive packages or powerful, user-tested software, call A.M. Electronics. We manufacture and sell a complete line of affordable, high-quality and *readily-available* disk drive components and software to expand the capabilities of your TRS-80™ system.

Disk drive enclosures
All enclosures feature:

- One year power supply guarantee. Each unit is 100% tested, regulated and fused.
- Optimum venting for lower operating temperatures
- Excellent RF interference shielding. Steel covers come with lustrous dark grey finish.
- Built-in provisions for optional extender cable (5¼ only).

COMPLETE DISK DRIVE PACKAGES FROM $325!

5¼-inch drives
40-track MPI 51 w/case, power supply and extender cable **$325**
80-track MP 91 w/case, power supply and extender cable **$560**
Special Offer! 8-inch drives for Model I or II
Single Siemens drive with case and power supply **$695**
New!
Dual Siemens drives with dual case and power supply **$1240**
(90 day limited warranty on disk drives)

CASES AND POWER SUPPLIES

5½-inch enclosures
Single drive unit case and power supply **$85**
Dual drive unit case and power supply **$120**
(Extender cables are $15 each extra)

8-inch enclosures
Single drive unit case and power supply **$150**
Dual drive unit case and power supply **$250**

Attention dealers, OEM's & distributors
Having trouble finding cases and power supplies for your disk drives? Call us for details on our attractive pricing and immediate product availability.

NEW! TRS—80™ Model III
With two double-density *80 track* disk drives **$2,495**

TRS-80™ SOFTWARE PACKAGES

MAKE80©
Converts 35 or 40 track diskettes into 80 track readable diskettes..... **$14.95**
B-17 tape operating system
For high speed (1700 baud) loading & saving of BASIC/machine language programs, almost 4 times faster than regular TRS-80™ interface **$24.95**

SUPER UTILITY, by Kim Watt.
Stand-alone 24K machine language program for disk includes:

ZAP UTILITY
- Read/modify data regardless of disk protection • One-step track-to-track/sector to sector • Dual cursors; ASCII and Hex. Modify in Hex, Decimal or ASCII • Display disk sectors, display file sectors, copy disk sectors, compare disk sectors, display/modify main memory, search memory or disk for specified string and return location

PURGE UTILITY
- Kill files by file spec or category • Zero out unused directories or sectors
- Compute passwords, change disk's name, date, passwords, protection levels • Directory routine indicates all active and inactive files, their location in directory and status of granules

DISK COPY UTILITY
- Copy *any* TRS-80™ readable disk, regardless of protection

TAPE COPY UTILITY
- Copy *any* TRS-80™ readable tape, regardless of protection or baud rate

DISK REPAIR UTILITY
- *Automatically* repair damaged HIT, GAT or BOOT sectors • Directory check advises of errors • Automatic recovery of killed files • Shows active and inactive files, and their location on the disk

MEMORY UTILITY
- Move memory • Jump to memory • Test memory • Compare memory • Input or output any byte to any port • Zero memory • Exchange memory • Edit memory • Load memory

SUPER UTILITY is now available for **$49.95,** plus $2.50 shipping and handling!

The power behind the drives©

AMI

✓39

A.M. ELECTRONICS, INC.

3366 Washtenaw Ave.
Ann Arbor, Michigan 48104
(313) 973-2312

master charge VISA

'*TRS-80 is a trademark of Tandy Corp.

Visit our retail showroom for a "hands-on" look at our wide selection of TRS-80™ hardware, software and peripherals! Hours: Tues.-Fri. 11-7, Sat. 11-5

The campus hero at the University of Louisville is micro-sized.

The Microprocessor as Tutor

By Ken Reid

Computers are widely used in instruction, and can be employed in very sophisticated ways. Instructional techniques that depend entirely on computer power include real-time simulations of aircraft, industrial processes and the human body (Massachusetts General Hospital simulated patients). But much of today's computer-assisted instruction is less sophisticated. It is usually just a variant of the frame-choice branching program illustrated in Fig. 1.

How small, how simple and how inexpensive can a system be and still provide the logical capabilities needed for this type of instructional program? The answer is, surprisingly, that a microprocessor is quite capable of doing it—not for one student, but for a whole class at the same time. This can be done by carefully distributing the parts of the task among devices specifically designed for their particular function.

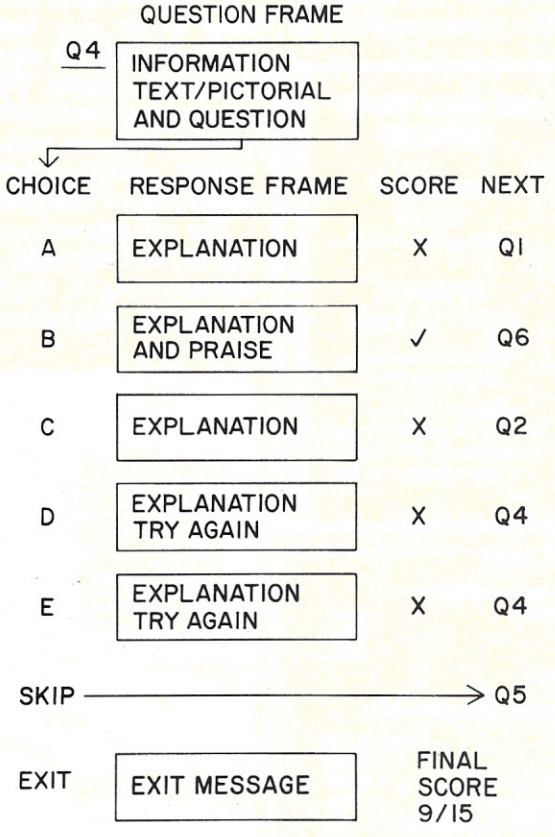


Fig. 1. Logical structure of frame-oriented computer-aided instruction (CAI) or computer-aided evaluation (CAE). (If the text material is sufficient to enable the student to answer the question, it is CAI; if he is being evaluated on information acquired from other sources, it is CAE.) Each question frame offers a choice of possible responses; depending on the response chosen, additional explanatory text is presented. Wrong choices lead to review frames (A,C) or to chances to try other choices for the same question (D,E). The correct choice leads to more advanced material. Some systems permit a student to skip a part he finds irrelevant to his goals; all permit a voluntary exit.

The appropriate parts distribution is illustrated in Fig. 2. Instructional text (including pictures) is stored photographically on microfiche cards, which act as inexpensive, compact and reliable ROM. The logical structure of the lesson is stored separately, either in ROM or on floppy disk, as a 256-byte *linkage list.* This is read into the computer whenever a student requests a new lesson topic. The driver program is content-free; for example, it contains no lesson-specific data, but simply interprets student input according to instructions in the linkage list. The communication with the student is also content-free; the student uses a small seven-key keyboard to respond, and the computer uses a small predefined vocabulary and a three-line video display to inform the student of his progress and to tell him where to look next on the lesson card.

With this system, one microprocessor can maintain 24 active student terminals at the same time, using a polling loop in the driver program. Response time is, at worst, two seconds, and is limited by the need to read linkage list data from floppy disk.

Ken Reid, 1935 Trevilian Way, Louisville, KY 40205.

GLOBAL™ DATABASE MANAGEMENT SYSTEM

Extremely comprehensive, versatile user-oriented management system for database creation and list maintenance. Runs under CP/M* and CBASIC2 on a microcomputer system in only 40K RAM.**

Supplied on standard 8" IBM disk (TRS-80 Model II), complete with BASIC subroutine library in source code, with comprehensive manual.

$295

MANUAL ONLY...$25

Add { Shipping $2.00, C.O.D. 1.00, Sales Tax where applicable

*Trademark of Digital Research
**Trademark of Software Systems

DEALER INQUIRIES INVITED

GLOBAL PARAMETERS ✓104

1505 Ocean Ave., Brooklyn, N.Y. 11230
212/252-5002

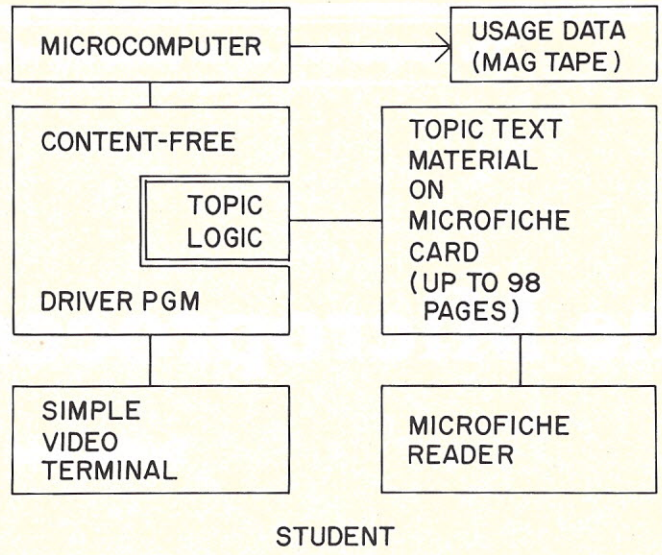
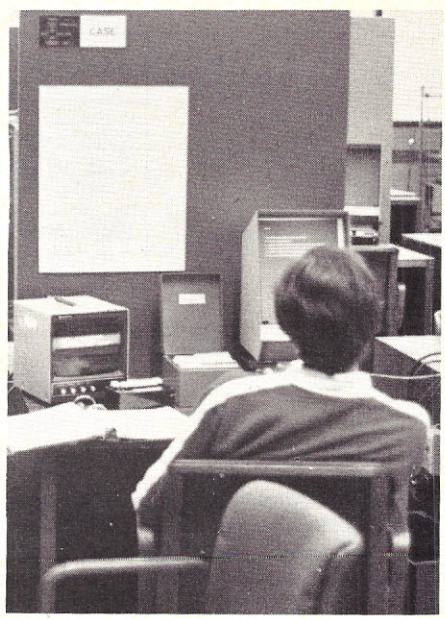


Fig. 2. Logical separation of components required for student-controlled CAI or CAE of the type diagrammed in Fig. 1.

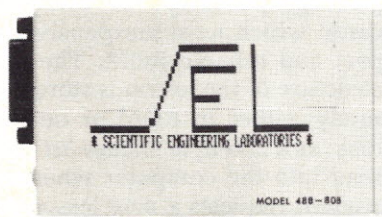
During operation, the driver program (Fig. 3) runs a cyclic scan of all keyboards. When a change in status is detected, the response is read in. Three variables are then passed to the response subroutine: N, the user or station number; F, the functional status of that user; and X, the actual response made. The status variable F is needed because responses have different meanings during sign-on and during the learning interaction. A logical diagram of the F cycle is shown in Fig. 4.

The system so defined is specifically suited to self-instruction and self-evaluation. This is so because the student is the only link between the computer and the manually operated microfiche reader. The reader could be computer-controlled, but its cost would rise from under $300 to over $3000, which is not economically justifiable for this application.

The microprocessor hardware we use at the University of Louisville is shown in Fig. 5. We chose an industrial-grade microprocessor to ensure



The system in use.



IEEE-488 to TRS-80* INTERFACE

Mod. 488-80B
$225.00
+ shipping, insurance & tax

SPECIFY DISK OR TAPE

For Model 3 Operation Contact Factory

Everything needed to add *powerful GPIB-488 controller capability* to TRS-80, Model 1, Level 2 or DOS

*Trade Mark of Tandy Corp. There is no affiliation between Scientific Engineering Laboratories and Tandy Corporation or Radio Shack.

SCIENTIFIC ENGINEERING LABORATORIES ✓117
11 NEIL DRIVE • OLD BETHPAGE, NEW YORK 11804
TELEPHONE (516) 694-3205

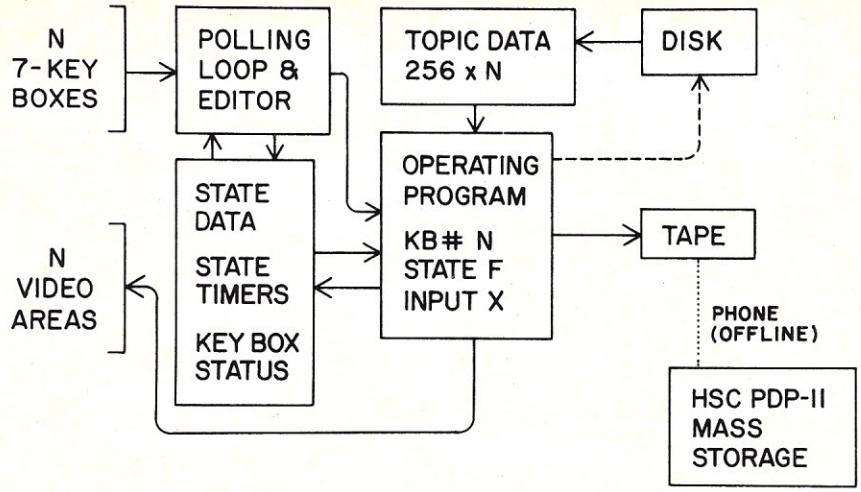
TRS-80 & OTHER NEEDS FILLED FOR LESS

+ + + COMPATIBLE DISK DRIVES WITH POWER SUPPLY AND CASE—120 DAY WARRANTY + + +
• 40 TRACK (204,800 BYTE/DISK) USE BOTH SIDES, ANTI-CRIMP/POWER PROTECT **$319**
• 8 IN. DRIVE & P.S./CASE **$749** WITH P.S./CASE FOR 3 DRIVES **$929**
• 80 TRACK (204.8K BYTE) 90 DAY WARRANTY **$419**
• 4-DRIVE CABLE **$28** •• 10 DISKS-5 IN. @ **$24**-8 IN. @ **$36** HARD CASE **$3 & 5**

BASE 2 PRINTER **$599** EPSON MX-80 PRINTER **$550** MICROLINE 80 PRINTER $549

• CENTRONICS 737 **$789** + + + + + CABLE @ **$25**
• HARRIS SELECTRIC (WORD PROCESSING-TYPEWRITER & PRINTER) **$790**
• LOWER CASE FOR CENTRONICS 779/RADIO SHACK LINE PRINTER 1 -EASY INSTALL **$99.95**
• UPS (UNINTERRUPTIBLE POWER SUPPLY) PREVENT POWER DROP SURGE OR OUT? FROM **$195**
• CAT MODEM (ORIG/ANS) **$144** + + + + + + + + 16K MEMORY SET (200 NANO) **$42**
• 16K MODEL III RADIO SHACK SYSTEM **$889**
• APPLE, ATARI, RADIO SHACK MODEL 1/2 HARDWARE/SOFTWARE DISCOUNTED. A/R, A/P, G/L, P/R FOR **$200 or $59 ea.** (MODEL 1) & **$329 or $80 ea.** (MODEL 2). APPLICATIONS INTERACT & ARE COMPLETE & PROFESSIONAL. WILL RUN ON OTHER COMPUTERS. THIS IS A SPECIAL INTRODUCTORY PRICE.
• ASK FOR FREE FLYER WITH OUR LOW PRICES—DEALER INQUIRIES INVITED MASS. RESIDENTS ADD 5% TAX—F.O.B. TEWKSBURY—FREIGHT EXTRA.
M/C, VISA OR CHECK ACCEPTED. TRS-80 IS A REG. TRADEMARK OF TANDY CORP. ✓140

OMNITEK SYSTEMS — 24 MARCIA JEAN DR., DEPT. K, TEWKSBURY, MA 01876 CALL 617-851-3156



CASEGO.N FLOWCHART

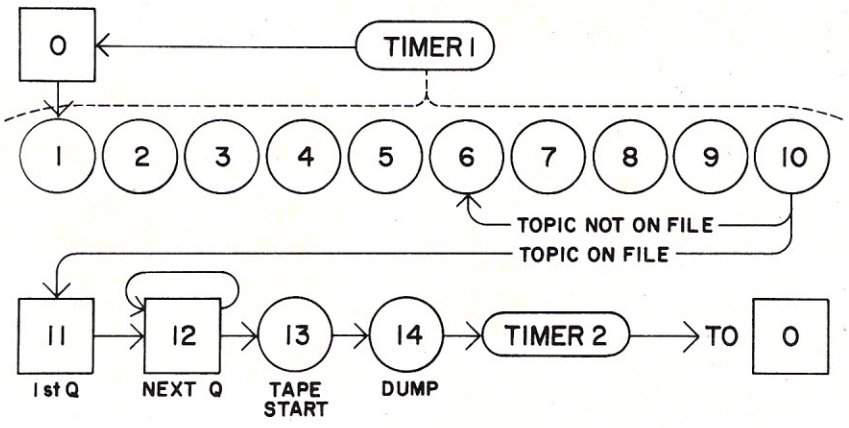
Fig.3. Block diagram of content-free driver program and its interactions with the linkage list (topic data), the keyboxes and the video monitors. The video displays are memory-mapped. Usage data is saved on magnetic tape and transferred off-line to the Health Sciences Center PDP-11 computer disk files.

a high degree of reliability under conditions of continuous use. Our system has now operated for 14 months with less than 5 percent unscheduled down-time; most of our problems have turned out to involve peripheral wiring or program bugs. The system is located in our Health Sciences Library and is available whenever the library is open.

Total hardware cost, including TV monitors, microfiche readers, spare parts and repair equipment, was about $15,000. A single duplicate of the computer, without peripherals, would cost under $5000. The available terminal hours, assuming that the library is open 15 hours a day for 360 days a year, total 129,600, giving a cost-per-available-hour of less than 12 cents.

Not all available hours are used, of course. Our students actually use only about 3000 terminal hours/year, with wide fluctuations in intensity of use depending on course load and the approach of examinations. Cost per hour of actual use is thus about $6.50 to pay off the hardware in one year. Using a more reasonable five-year payoff period would bring hardware cost down to $1.30 per user hour.

Hardware cost is not the whole story, as many CAI users have discovered. Someone must design and write the lessons, and this is high-level, intellectually demanding work. Furthermore, a lesson is not a one-



STATE SEQUENCE DIAGRAM : CASEGO. N

Fig. 4. Transition state diagram for the driver program. During states 1–5, the student enters a five-letter identification code. During states 6–10, he enters a five-letter code identifying the topic he wishes to study. While questions are being answered, the function states 11 and 12 are used; 12 is used for all questions after the first. States 13 and 14 cover activities at the end of the test. States 1–10 time out automatically to state 0 after two minutes to free the work station if the student leaves the terminal. State 14 displays the final score data for four minutes and then reverts to state 0: "terminal free."

NO ONE CAN MAKE A TRS-80 WORK THE WAY SNAPP CAN!

SNAPP II EXTENDED BASIC A family of enhancements to the Model II BASIC interpreter. Part of the package originated with the best of APPARAT, INC.'s thoughts in implementing NEWDOS BASIC. The system is written entirely in machine language for SUPER FAST execution. The extensions are fully integrated into Model II BASIC, and require NO user Memory, and NO user disk space. The package is made up of the following six modules, each of which may be purchased separately:

XBASIC—Six single key stroke commands to list the first, last, previous, next, or current program line, or to edit the current line. Includes quick way to recover BASIC program following a NEW or system or accidental re-boot. Ten single character abbreviations for frequently used commands: AUTO, CLS, DELETE, EDIT, KILL, LIST, MERGE, NEW, LLIST, and SYSTEM. $40.00

XREF—A powerful cross-reference facility with output to display and/or printer. Trace a variable through the code. Determine easily if a variable is in use. $40.00

XDUMP—Permits the programmer to display and/or print the value of any or all program variables. Identifies the variable type for all variables. Each element of any array is listed separately. $40.00

XRENUM—An enhanced program line renumbering facility which allows specification of an upper limit of the block of lines to be renumbered, supports relocation of renumbered blocks of code, and supports duplication of blocks of code. $40.00

XFIND—A cross reference facility for key words and character strings, also includes global replacement of keywords. $40.00

XCOMPRESS—Compress your BASIC programs to an absolute minimum. Removes extraneous information; merge lines; even deletes statements which could not be executed. Typically saves 30-40% space even for programs without REM statements! Also results in 7-10% improvement in execution speed. $40.00

ENTIRE PACKAGE ONLY $200.00

SNAPP INC

8160 Corporate Park Dr.
Cincinnati, Ohio 45242 ✓257

Call Toll Free
1 - 800 - 543-4628
Ohio residents
call collect (513) 891-4496

All products now available to run with TRSDOS 2.0.
Now available for Model III

✓Reader Service—see page 226



The keyboard and terminal.

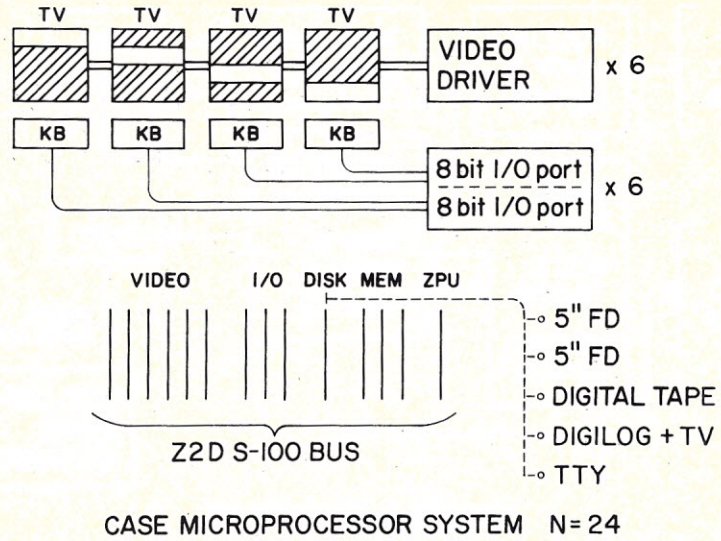


Fig. 5. Hardware configuration for our CAE systems. Six memory-mapped video drivers (SSM VB1, 16 lines × 32 characters/line) are used to drive 24 Sanyo VM4209 video monitors. The monitors are masked so that each user sees only four of the 16 lines. Three of the four lines are used to communicate with the student; the fourth is left blank to minimize problems of vertical drift. Each student has a seven-key input box. The key inputs are converted to three-bit binary code and latched until queried by the polling loop. The microcomputer used is a Cromemco Z2D configured as shown. A digital tape unit (Computer Aid by National Multiplex Company) and a video monitor share one 300 baud serial port; other devices are connected when needed. One five-inch floppy disk is sufficient for operation, but we have two for ease in copying and updating disks.

time investment, but a continuing process, demanding new editions at regular intervals. How do we persuade people to do this work?

Some, indeed many, teachers will do it for fun—at least at first. Much CAI material has been written with no other motivation but curiosity—to try out a new teaching technique. But the novelty wears thin after the second or third revision.

Some large CAI networks, notably the Plato project of the University of Illinois, have hired Ph.D.s fulltime as writers. This gets the work done, but few schools can afford this route.

There is, however, a well-known middle road, familiar to writers of textbooks. This is the payment of royalties according to use.

How do you measure use? The microcomputer does this as part of its normal operation. As a student interacts with his lesson, each question and response is recorded. When he finishes a card, this usage history is dumped to cassette tape. Periodically the tape is picked up and read, over the telephone, to a disk file on a large computer. At the end of the year, this file is processed, and a report is prepared on each lesson topic. The report is sent to each author for use in preparing next year's edition of the lesson topic.

The overall circulation of information in the system is summarized in Fig.6.

Does it work? Yes. Table 1 summarizes use over the past five years. Until January 1979, we used terminals on a large time-shared computer. We switched to the microprocessor because the large system was becoming overloaded with other uses and the response time was getting too long. Since the changeover, use has increased. Our main problem now is persuading authors to keep topics up-to-date and to improve the quality of their material—problems that we share with publishers of text material in the traditional paper and ink format.■

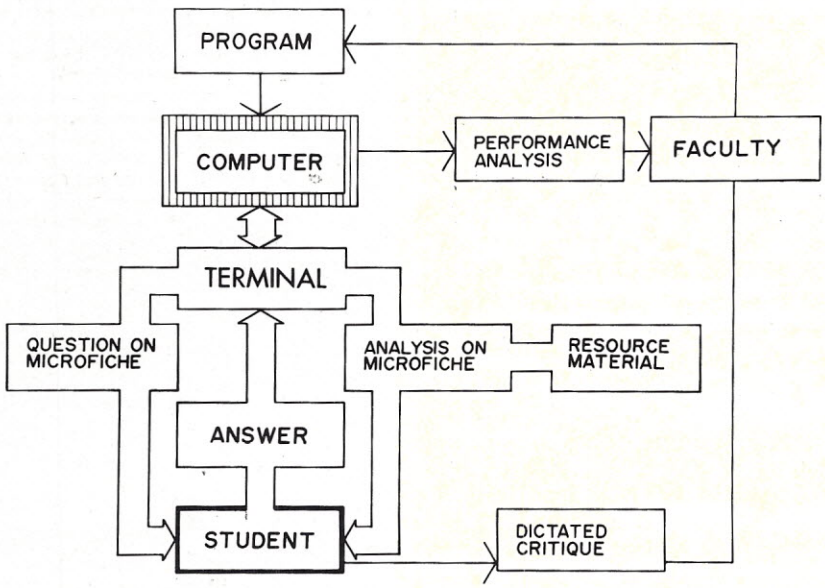


Fig. 6. Conceptual layout of our current systems for computer-assisted self-evaluation. In addition to the operating program (Fig. 3), other programs on a larger computer are used to edit and check instructional material, code linkage lists and analyze usage data. Student comments are telephoned to the office or provided in written form through a suggestion box and an annual class survey.

Year	Spring	Fall
1979	73,003	25,829
1978	45,231	21,088
1977	60,535	20,873
1976	65,279	15,000
1975	61,282	N.A.

Table 1. Usage data in responses per semester. In 1975 we operated only during the spring semester. The transfer to the microprocessor occurred on January 15, 1979. The upsurge in use compared to spring 1978 is attributed to better response time. The educational material available for use in fall semester courses is still quite limited in comparison to that available for spring semester courses.

SUPER BRAIN QD™

Once in a great while someone comes along with a simple improvement for an already great product. Take our SuperBrain, for example. Really a simple concept. A high-powered, low cost microcomputer packaged in an attractive desk top cabinet. So how do you improve on that?

WE DID IT...

It wasn't enough that our SuperBrain had such standard features as twin double density 5¼" drives with over 300,000 bytes of disk storage. A full 32K of dynamic RAM - expandable to 64K in seconds. A CP/M* Disk Operating System which assures compatibility to literally hundreds of application packages presently available. A crisp, 12" non-glare screen with a full 24 line by 80 column display. A full ASCII keyboard with a separate keypad and individual cursor control keys. Twin RS232C serial ports for fast and easy connection to a modem and/or a printer. And, dual Z80 processors which operate at 4 MHZ to insure lightning-fast program execution. No, it wasn't enough. So we made it better.

ANNOUNCING SUPERBRAIN QD...

Our new QD model has all of the features of our phenomenally popular SuperBrain with the addition of double-sided disk drives and an extra 32K of dynamic RAM. So, for only a modest increase in price, you can order your next SuperBrain with more than twice the disk and memory storage capability. But, best of all, the new QD model has the same tough, rugged construction and exceptional quality that made our SuperBrain such a success.



HOW DID WE DO IT?

The secret of SuperBrain QD's incredible disk storage lies within our new double-density double-sided disk drives. A total of nearly 720,000 bytes of data are formatted on two specially designed 5¼" drives. And that's more than enough to get you started with most serious small business applications. And SuperBrain QD's standard 64K of dynamic RAM will handle even the most complicated programming tasks.

Of course, if you're into megabytes instead of kilobytes, you may think neither SuperBrain is right for you. Not so! Intertec offers 20-96 megabytes of hard-disk storage which connects in seconds to either the SuperBrain or SuperBrain QD. So, your original investment is always protected. As you grow. No matter how much your needs expand.

BUT IS IT RELIABLE?

Our best salesmen are our present users. Not only have SuperBrain users been impressed with the inherent reliability of the system, they tell us that no other microcomputer system available today offers such a unique modular design concept. Just about the only tool required to easily maintain the system is a common screwdriver. And Intertec's total commitment to product service and customer support, with service outlets in most major cities, insures your original investment will be a valuable one for many years to come.

THE DECISION IS YOURS.

Whether your next SuperBrain is a regular model or our QD version, you will have the satisfaction of knowing you purchased what is becoming one of the world's most popular microcomputer systems. And regardless of which model you choose, you'll probably never outgrow it because you can keep expanding it.

So, call or write us today for more information. Intertec systems are distributed worldwide and may be available in your area now.

INTERTEC DATA SYSTEMS®

2300 Broad River Rd., Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115

196



*Registered trademark of Digital Research, Inc.

Motorola's latest addition to its M6800 family of eight-bit microprocessors.

6801: A One-Chip System

By H. W. Neff

Considering the current 16-bit brouhaha, the idea of a new eight-bit microprocessor is almost passe. But the Motorola 6801 is definitely not ho-hum. In terms of software, this "new" machine is an old friend with some significant additions to its bag of tricks. And hardware? Just add power supply, crystal and your own abilities.

In the last couple of years electronics literature has chronicled Motorola's additions to the M6800 family of eight-bit microprocessors. While maintaining the basic architecture of the original machine, the evolution of these newer processors has proceeded on two fronts: performance and functionality. Fig. 1 illustrates the relationship between the 6800 and its descendants.

Motorola doubled the speed of the original machine with the 68B00. The next boost came with the 6809. Its overall performance has been hiked by three or four times that of the original 6800, making it a 16-bit wolf in eight-bit sheep's clothing.

The company has been cramming more and more onto less and less silicon. This first produced the 6802, a 6800 processor plus a clock (6875) and 128 bytes of RAM (6810). Like the 6800, the 6802 packs the punch of 80 pins' worth of processor and support into a 40-pin package, though the two are not pin-for-pin compatible.

The next device to evolve is Motorola's MC6801, which is further above the 6802 than the 6802 is above the 6800. Because of the HMOS design and fabrication process, it is smaller, faster and has lower power.

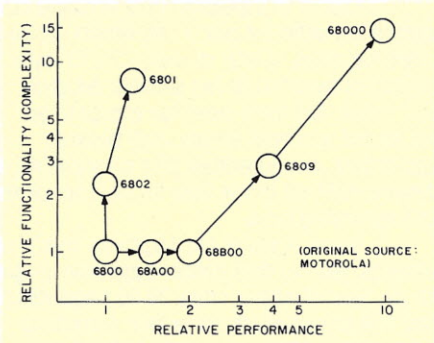


Fig. 1. Evolution of the 6800 microprocessor family.

The phenomenal hardware density of the 6801 is the key to its increased functionality, while several new instructions and faster instruction timing give it a boost in the performance range as well. This is reflected in the relative position of the 6801 in Fig. 1.

Hardware Density

The 6801 represents a significant advance in hardware density over the original 6800. Both devices come in 40-pin packages, but the 6801 is roughly equivalent to the original 6800 plus six family support devices. The equivalent pin count for the 6801 is in excess of 180 6800 era pins. Fig. 2 illustrates the hardware relationships between the 6800 and several of its descendants, including the 6801.

The 6801 also has an on-chip clock oscillator, comparable to the 6875. Only an external crystal at four times the desired clock rate is required for machine timing. For multiprocessor operations, an external 4× single-phase clock may be provided in place of the crystal. Originally, a 6801E was planned for external clock operation, but the 6801 is capable of operating in both modes.

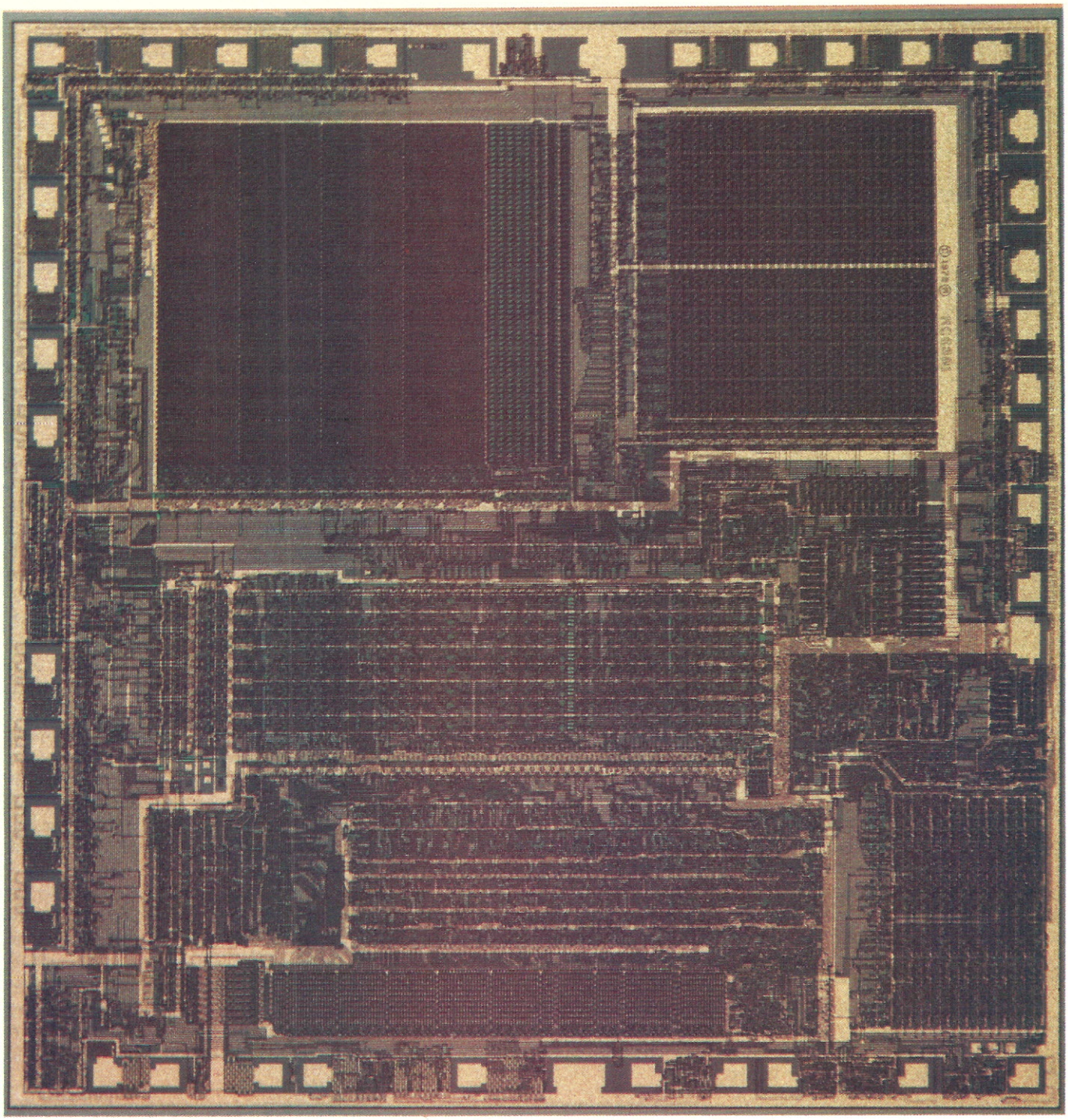
The 6801 provides an on-chip serial communications interface (SCI) comparable to the 6850 ACIA. The SCI is controlled by four registers and is capable of several operational configurations. Two different serial data formats (NRZ and bi-phase) are provided at any of our different internally derived data rates. Or, if required, you may configure the SCI to operate with an external clock source.

The SCI also sports a "wake-up" feature, which is useful in multiprocessor communications where the first information is the address of the destination processor. After monitoring enough of the message to determine the destination, the nonselected processors can ignore the remainder of the message by putting the SCI to sleep. The SCI will automatically wake up upon receipt of ten consecutive 1's, which the protocol should define as the line idle condition between messages.

The 6801 contains a 16-bit programmable timer that is functionally equivalent to a third of the 6840 support chip. The 6801's timer is a three-function resource. The timer has a free-running 16-bit counter, which may be read at any time by software. The timer is capable of generating output pulses with a programmed width and simultaneously measuring the width of an independent input pulse.

The 6801 has extensive on-chip

H. W. Neff, P.O. Box 3359, San Leandro, CA 94578.



The 6801 chip. (Photo courtesy Motorola Semiconductor Products, Inc.)

memory resources. It has a 2K ROM (equivalent to the 68316) and 128 bytes of RAM. The RAM is functionally equivalent to the 6810, with the additional ability to maintain 64 bytes when the 6801 is in power down mode. The on-chip ROM is mask-programmed at the factory with the pattern provided by the buyer (along with an order for approximately 1000 pieces).

For evaluation purposes, Motorola makes a 6801 with a 2K monitor called LILBUG already in ROM. Details on the LILBUG monitor and a source listing are available from Motorola. The 6801 with LILBUG is identified as the MC6801L1 and costs approximately $50. For prototyping and small-quantity jobs an EPROM version (the 68701) and a ROM-less version (the 6803) are available. The prices for these devices are approximately $150 and $45, respectively.

New Instructions

The 6801 is source- and object-code-compatible with the 6800. In addition to the original instructions of the 6800, 12 new instructions are available. These include the much-needed push and pull stack operations for the X (index) register and seven 16-bit operations. These instructions operate on the newly defined D register.

As shown in Fig. 3, the D register is formed by the concatenation of the A and B registers. Included in the 16-bit operations is an 8×8 multiply. The multiply instruction uses the contents of A and B as multiplicands and

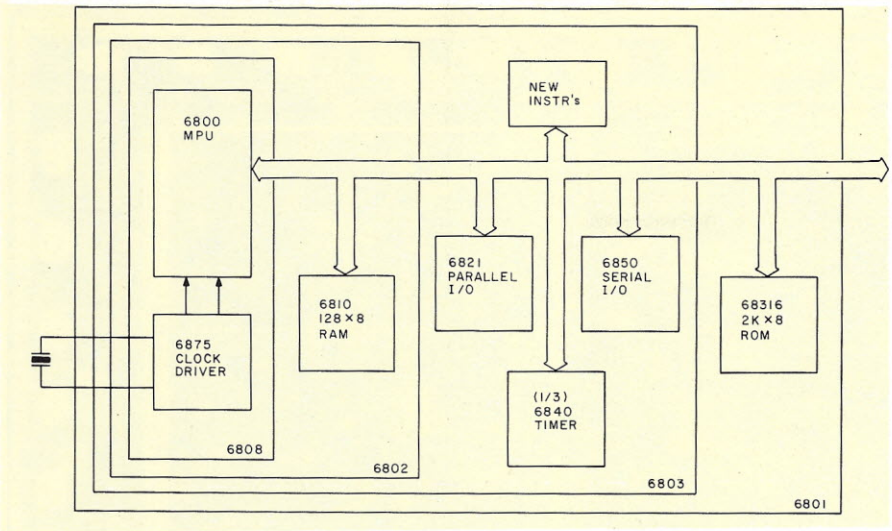


Fig. 2. Functional hardware comparison of 6800 family processors.

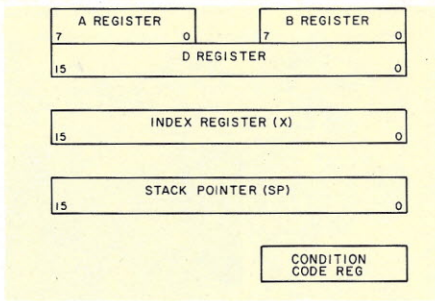


Fig. 3. Programming model for the 6801.

stores the product in D.

Two instructions have been modified in the 6801. The JSR (jump to subroutine) instruction has been altered to include the direct addressing mode. The second changed instruction is CPX (compare index register). The CPX instruction has been modified to appropriately set or reset additional flags in the condition code register. This may have subtle side effects in older code transported to the new machine, so keep a watchful eye.

The new and modified instructions for the 6801 are summarized in Table 1. For more details, refer to the 6801 data sheet and programming reference card. Both items are available at no charge from Motorola.

Faster Instruction Execution

The addition of the new instructions gives the 6801 increased capabilities over the 6800 and 6802. The 6801 also gets a performance boost from some improved instruction execution times. All of the Jump and Branch instructions have been made one cycle faster. This amounts to a 25 percent decrease in execution time for these instructions. In the indexed addressing mode the execution time of instructions has been shortened by one cycle. For most instructions this results in a 20 percent reduction in execution time.

Note that one instruction has actually become slower in the 6801. The increased functionality gained in the modification of the CPX instruction has made it one cycle slower than before. In the indexed addressing mode this extra cycle is offset by the increased speed of the mode for all instructions, resulting in an unchanged execution speed.

One Chip Minimum System

The minimum system for a 6801 consists of a 6801 and from zero to three support chips. The reason for the variance lies with the 6801 itself. On reset the 6801 is hardware-programmed into one of three basic configurations. The configuration requiring no additional support is rightfully dubbed the single chip mode. In this mode the 6801 looks like four parallel ports and a serial port to the outside world. There is no external address or data bus available.

For systems requiring only a few bytes of I/O or external memory, the 6801 is configured into its expanded nonmultiplexed mode. In this mode two of the eight-bit parallel I/O ports become the external data and address buses. The external address bus is only eight bits wide, thus limiting the external memory or I/O to 256 bytes or less.

When more external resources must be accessed, the 6801 must be configured into its third operating mode. This mode (for those not tipped off by the name of the last one) is the expanded multiplexed mode. The expanded multiplexed mode uses two parallel ports as a high-order address bus and a multiplexed address and data bus. This allows all 16 address lines to be brought out, giving a full 64K address space. The address and data lines can be demultiplexed simply by the addition of a 74LS373 (or equivalent) octal latch, as illustrated in Fig. 4.

The expanded multiplexed mode can be particularly cost-effective for small systems. A $45 6803 (a ROMless 6801) plus a $20 EPROM and $5 worth of TTL is a lot cheaper than the $150 price tag on the 68701 (EPROM version).

If the prototyped system is to be duplicated in sufficient quantity to justify the ROM costs, there can be additional pleasant surprises inherent in the use of a 6801. In the expanded multiplexed mode you can configure the 6801 to place the internal ROM at F800 to FFFF. This is the

Index Register (X) Instructions	
ABX	Unsigned addition of the B register to X.
PSHX	Push X onto stack (least significant byte first).
PULX	Pull X from stack (most significant byte first).
CPX	Compare X. Modified for increased condition code register effects.
Program Control Instructions	
BRN	Branch never. Equivalent to a 2 byte NOP.
JSR	Jump to Subroutine. Direct addressing mode has been added.
16 Bit Instructions	
ADDD	Addition of memory to D without carry. Results are left in D.
ASLD	Shift D 1 bit towards MSB. MSB shifted into carry. LSB is cleared.
LDD	Load D from memory.
LSRD	Shift D 1 bit towards LSB. LSB shifted into carry. MSB is cleared.
MUL	8×8 multiply of A and B. 16 bit result left in D.
STD	Store D in memory.
SUBD	Subtract memory from D. Results are left in D.

Table 1. New and modified instructions for the 6801.

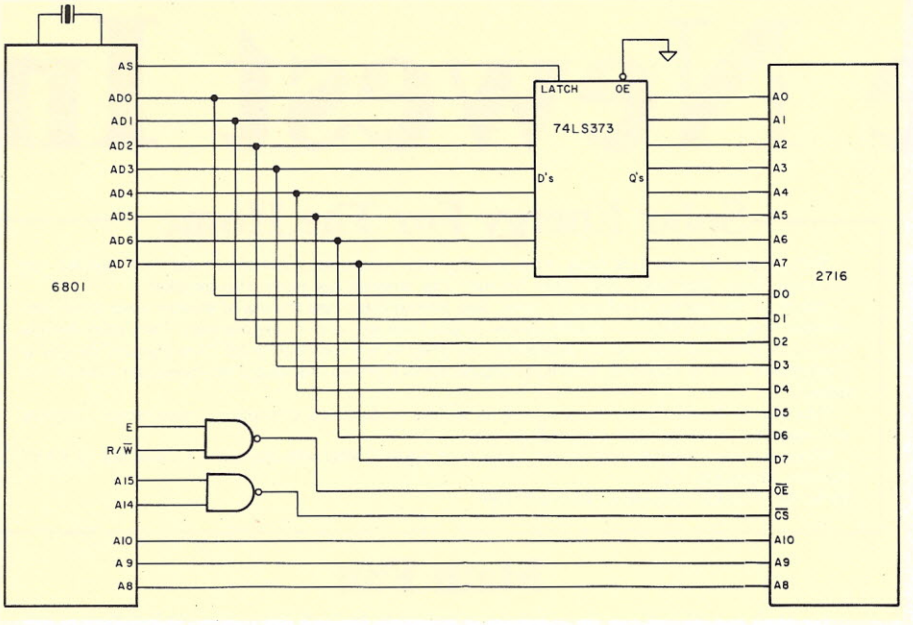


Fig. 4. 6801 expanded multiplexed mode minimum system with external EPROM.

same 2K area of memory occupied by the external EPROM illustrated in Fig. 4.

This leads directly to the pleasant fact that no new software needs to be developed when putting the code into ROM. (The less significant cost of the external EPROM and TTL also disappears.)

And finally, when the time comes to prototype the next system, just configure a 6803 out of one of the (inevitably produced) spare 6801s from the previous system and begin. This is a no-waste versatility virtually unmatched by any other processor available.

The 6801 was officially unveiled more than a year ago but is only now becoming widely available. The new instructions, timing and hardware density result in a powerful and easy-to-use device that is the latest development in the art of putting a computer system on a chip. The 6801 is ripe for plucking by anyone with the slightest motivation, and I fully expect to see it appearing on several boards for home systems in the coming months.

Data sheets and other 6801 literature may be obtained by contacting Motorola at: Technical Information Center, Motorola Semiconductor Products, Inc., P.O. Box 20924, Phoenix, AZ 85036.■

MORE FOR YOUR RADIO SHACK TRS-80 MODEL I !

★ **MORE SPEED**
10-20 times faster than Level II BASIC.

★ **MORE ROOM**
Compiled code plus VIRTUAL MEMORY makes your RAM act larger.

★ **MORE INSTRUCTIONS**
Add YOUR commands to its large instruction set!
Far more complete than most Forths: single & double precision, arrays, string-handling, more.

★ **MORE EASE**
Excellent full-screen Editor, structured & modular programming
Optimized for your TRS-80 with keyboard repeats, upper/lower case display driver, single- & double-width graphics, etc.

★ **MORE POWER**
Forth operating system
Interpreter AND compiler
Internal 8080 Assembler
(Z80 Assembler also available)
VIRTUAL I/O for video and printer, disk and tape
(10-Megabyte hard disk available)

MMSFORTH

THE PROFESSIONAL FORTH FOR TRS-80 MODEL I
(Over 1,000 systems in use)

MMSFORTH Disk System V1.9 (requires 1 disk drive & 16K RAM) ..... just **$79.95***
MMSFORTH Cassette System V1.8 (requires Level II BASIC & 16K RAM) **$59.95***

AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided
MMSFORTH Newsletter
Many demo programs aboard
MMSFORTH User Groups
Programming staff can provide advise, modifications and custom programs, to fit YOUR needs.

MMSFORTH UTILITIES DISKETTE: includes FLOATING POINT MATH (L.2 BASIC ROM routines plus Complex numbers, Rectangular-Polar coordinate conversions, Degrees mode, more), plus a full Forth-style Z80 ASSEMBLER; plus a powerful CROSS-REFERENCER to list Forth words by block and line. All on one diskette (requires MMSFORTH, 1 drive & 16K RAM), .. **$39.95***

THE DATAHANDLER V1.1, a very sophisticated database management system operable by non-programmers (requires Disk MMSFORTH, 1 drive & 32K RAM); with manuals, ... **$59.95***

FORTH BOOKS AVAILABLE

MICROFORTH PRIMER (comes with MMSFORTH) separately **$15.00***
USING FORTH — more detailed and advanced than above **$25.00***
Threaded Interpretive Language — Excellent Analysis of MMSFORTH — Like Language, Advanced **$18.95***
CALTECH FORTH MANUAL — good on Forth internal structure, etc **$10.00***

* — Software prices include manuals and require signing of a single-system user license. Add $2.00 S/H plus $1.00 per additional book; Mass. orders add 5% tax. Foreign orders add 15%. UPS COD, VISA & M/C accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information. Good dealers sought.

Get MMSFORTH products from your computer dealer or
MILLER MICROCOMPUTER SERVICES (K1) ✓225
61 Lake Shore Road, Natick, MA 01760
(617) 653-6136

THE MICRO CLINIC

CENTRONICS 779/RS PRINTER I LOWER CASE KIT

Don't let the newer low-priced printers with lower-case capabilities make your Centronics 779/Radio Shack Printer I obsolete! Our assembled and tested CLC-1 conversion kit will give your 779 the full upper/lower case character set at a fraction of the cost of a new printer. Illustrated instructions make installation easy - just 3 connections, no etch cuts. Compare our introductory price to other kits selling for $125 - at $99 our CLC-1 kit brings your 779 into the 80's and makes word processing a practical application.

CLC-1 INTRODUCTORY PRICE: $99
Includes P/H CA add 6% tax.

VISA/MC include card number, signature, exp. date, phone number. MC include interbank number. Introductory price good thru 1/31/81.

THE MICRO CLINIC ✓216
17375 Brookhurst • Suite 114
Fountin Valley, CA 92708

SURPLUS ELECTRONICS

ASCII ASCII

TRS-80* COMPATIBLE,
IBM SELECTRIC®-BASED
I/O TERMINAL with
ASCII conversion installed: **$645.00**

Many Other Items Available:
Tape Drives; Cable;
Cassette Drives; Wire; Power Supplies (5 volt 35 amp, others); Displays; Cabinets; Transformers; Heat Sinks; Printers; Components.

Send for free catalog.
WORLDWIDE ELECT. INC.
130 Northeastern Blvd.
Nashua, NH 03062 ✓122
Phone orders accepted using VISA or Master Charge
TOLL FREE 603-889-7661 • 1-800-258-1036
TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation.

The Newest In

Apple Fun

We've taken five of our most popular programs and combined them into one tremendous package full of fun and excitement. This disk-based package now offers you these great games:

Mimic—How good is your memory? Here's a chance to find out! Your Apple will display a sequence of figures on a 3×3 grid. You must respond with the exact same sequence, within the time limit.

There are five different, increasingly difficult versions of the game, including one that will keep going indefinitely. Mimic is exciting, fast paced and challenging—fun for all!

Air Flight Simulation—Your mission: Take off and land your aircraft without crashing. You're flying blind —on instruments only.

A full tank of fuel gives you a maximum range of about 50 miles. The computer will constantly display updates of your air speed, compass heading and altitude. Your most important instrument is the Angle of Ascent/Bank Indicator. It tells if the plane is climbing or descending, whether banking into a right or left turn.

After you've acquired a few hours of flying time, you can try flying a course against a map or doing aerobatic maneuvers. Get a little more flight time under your belt, the sky's the limit.

Colormaster—Test your powers of deduction as you try to guess the secret color code in this Mastermind-type game. There are two levels of difficulty, and three options of play to vary your games. Not only can you guess the computer's color code, but it will guess yours! It can also serve as referee in a game between two human opponents. Can you make and break the color code...?

Star Ship Attack—Your mission is to protect our orbiting food station satellites from destruction by an enemy star ship. You must capture, destroy or drive off the attacking ship. If you fail, our planet is doomed...

Trilogy—This contest has its origins in the simple game of tic-tac-toe. The object of the game is to place three of your colors, in a row, into the delta-like, multi-level display. The rows may be horizontal, vertical, diagonal and wrapped around, through the "third dimension". Your Apple will be trying to do the same. You can even have your Apple play against itself!

Minimum system requirements are an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive. Mimic requires Applesoft in ROM, all others run in RAM or ROM Applesoft.

Order No. 0161AD $19.95

Solar Energy For The Home

With the price of fossil fuels rising astronomically, solar space-heating systems are starting to become very attractive. But is solar heat cost-effective for you? This program can answer that question.

Just input this data for your home: location, size, interior details and amount of window space. It will then calculate your current heat loss and the amount of gain from any south facing windows. Then, enter the data for the contemplated solar heating installation. The program will compute the NET heating gain, the cost of conventional fuels vs. solar heat, and the calculated payback period—showing if the investment will save you money.

Solar Energy for the Home: It's a natural for architects, designers, contractors, homeowners...anyone who wants to tap the limitless energy of our sun.

Minimum system requirements are an Apple II or Apple II Plus with one disk drive and 28K of RAM. Includes AppleDOS 3.2.

Order No. 0235AD (disk-based version) $34.95

Math Fun

The Math Fun package uses the techniques of immediate feedback and positive reinforcement so that students can improve their math skills while playing these games:

Hanging—A little man is walking up the steps to the hangman's noose. But YOU can save him by answering the decimal math problems posed by the computer. Correct answers will move the man down the steps and cheat the hangman.

Spellbinder—You are a magician battling a computerized wizard. In order to cast death clouds, fireballs and other magic spells on him, you must correctly answer problems involving fractions.

Whole Space—Pilot your space craft to attack the enemy planet. Each time you give a correct answer to the whole number problems, you can move your ship or fire. But for every wrong answer, the enemy gets a chance to fire at you.

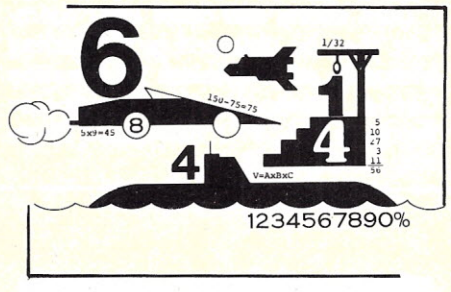
Car Jump—Make your stunt car jump the ramps. Each correct answer will increase the number of buses your car must jump over. These problems involve calculating the areas of different geometric figures.

Robot Duel—Fire your laser at the computer's robot. If you give the correct answer to problems on calculating volumes, your robot can shoot at his opponent. If you give the wrong answer, your shield power will be depleted and the computer's robot can shoot at yours.

Sub Attack—Practice using percentages as you maneuver your sub into the harbor. A correct answer lets you move your sub and fire at the enemy fleet.

All of these programs run in Applesoft BASIC, except Whole Space, which requires Integer BASIC.

Order No. 0160AD $19.95



Skybombers

Two nations, seperated by The Big Green Mountain, are in mortal combat! Because of the terrain, their's is an aerial war—a war of SKYBOMBERS!

In this two-player game, you and your opponent command opposing fleets of fighter-bombers armed with bombs and missiles. Your orders? Fly over the mountain and bomb the enemy blockhouse into dust!

Flying a bombing mission over that innocent looking mountain is no milk run. The opposition's aircraft can fire missiles at you or you may even be destroyed by the bombs as they drop. Desperate pilots may even ram your plane or plunge into your blockhouse, suicidally.

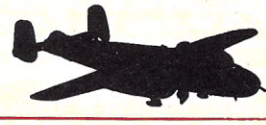
Flight personnel are sometimes forced to parachute from badly damaged aircraft. As they float helplessly to earth, they become targets for enemy missiles.

The greater the damage you deal to your enemy, the higher your score, which is constantly updated at the bottom of the display screen.

The sounds of battle, from exploding bombs to the pathetic screams from wounded parachutists, remind each micro-commander of his bounden duty. Press On, SKYBOMBERS—Press On!

Minimum system requirements: An Apple II or Apple II Plus, with 32K RAM, one disk drive and game paddles.

Order No. 0271AD (disk-based version) $19.95



Paddle Fun

This new Apple disk package requires a steady eye and a quick hand at the game paddles! It includes:

Invaders—You must destroy an invading fleet of 55 flying saucers while dodging the carpet of bombs they drop. Your bomb shelters will help you—for a while. Our version of a well known arcade game! Requires Applesoft in ROM.

Howitzer—This is a one or two person game in which you must fire upon another howitzer position. This program is written in HIGH-RESOLUTION graphics using different terrain and wind conditions each round to make this a demanding game. The difficulty level can be altered to suit the ability of the players. Requires Applesoft in ROM.

Space Wars—This program has three parts: (1) Two flying saucers meet in laser combat—for two players, (2) two saucers compete to see which can shoot out the most stars—for two players, and (3) one saucer shoots the stars in order to get a higher rank—for one player only. Requires Applesoft.

Golf—Whether you win or lose, you're bound to have fun on our 18 hole Apple golf course. Choose your club and your direction and hope to avoid the sandtraps. Losing too many strokes in the water hazards? You can always increase your handicap. Get off the tee and onto the green with Apple Golf. Requires Applesoft.

The minimum system requirement for this package is an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive.

Order No. 0163AD $19.95

Instant Software™

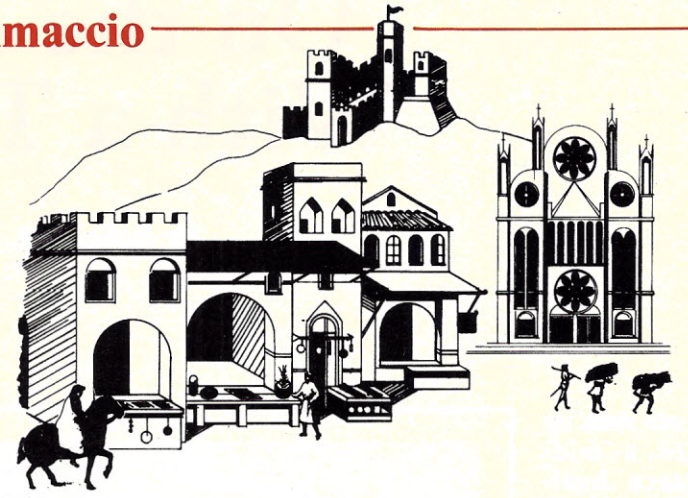
*A trademark of Apple Computer Inc.

PETERBOROUGH, N.H. 03458
603-924-7296

Apple* Software

From Instant Software

Santa Paravia and Fiumaccio



Buon giorno, signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could be sold instead for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase custom duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences...and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Peppone may invade you at any time.

To measure your progress, the official cartographer will draw you a *mappa*. From it, you can see how much land you hold. how much of it is under the plow and how adequate your defenses are. We are unique in that here, the map IS the territory.

I trust that I have been of help, signore. I look forward to the day when I may address you as His Royal Highness, King of Santa Paravia. *Buona fortuna* or, as you say, "Good luck". For the Apple 48K.

Order No. 0174A $9.95 (cassette version).
Order No. 0229AD $19.95 (disk version).

TO ORDER

SEE YOUR LOCAL INSTANT SOFTWARE DEALER OR USE THE ORDER FORM BELOW

For Fast Service *call now* Toll-Free 1-800-258-5473

Apple Cassettes

0018A Golf.....$7.95
0025A Mimic.....$7.95
0040A Bowling/Trilogy.....$7.95
0073A Math Tutor I.....$7.95
0079A Oil Tycoon.....$9.95
0080A Sahara Warriors.....$7.95
0088A Accounting Assistant.....$7.95
0094A Mortgage w/Prepayment Option/ Financier.....$7.95
0096A Space Wars.....$7.95
0098A Math Tutor II.....$7.95
0174A Santa Paravia and Fiumaccio.....$9.95
0148A Air Flight Simulation.....$9.95

We Guarantee It!

Instant Software Guarantee

OUR PROGRAMS ARE GUARANTEED TO BE QUALITY PRODUCTS. IF NOT COMPLETELY SATISFIED YOU MAY RETURN THE PROGRAM WITHIN 60 DAYS. A CREDIT OR REPLACEMENT WILL BE WILLINGLY GIVEN FOR ANY REASON.

106 107 108 109

Name _____

Address _____

City _____ State _____ Zip _____

☐ Check ☐ Money Order ☐ VISA ☐ AMEX ☐ Master Charge

Card No. _____ Exp. Date _____

Signed _____ Date _____

Order your Instant Software today!

Quantity	Order No.	Program name	Unit cost	Total cost
		Shipping and handling		$1.00
			Total order	

Instant Software™ Inc.
Peterborough, N.H. 03458

✓40

✓ Reader Service—see page 226

BUSINESS

On the Road With a TRS-80

By Ronald H. Bobo



A van rolls up to a mid-western business establishment. A tall, bespectacled young man with a beard emerges, runs a 100-foot extension cord to the nearest power source. Computervan is plugged in, ready to provide the business with on-site custom programming.

Computervan is just one feature of COMP-U-TRS, a unique new store in the growing St. Louis suburb of Florissant, MO. Sitting right next to a Radio Shack Computer Center, COMP-U-TRS sells software, and software only. Founder and owner John Knoderer claims that it is the first retail software store of its kind in the country.

Certainly, the van itself would qualify Knoderer as a free-thinking entrepreneur. The custom-designed vehicle roams the countryside from St. Louis, MO, to Leavenworth, KS, providing customers with programming and consulting services while their own computers remain free for normal use. What could be more convenient?

Considering Knoderer's background, it's not surprising that he comes up with such original ideas.

A member of the high-I.Q. society Mensa, Knoderer has always been interested in math. This, he feels, was probably responsible for his later affinity with computers.

"In the third grade," John recalls, "the teacher came up with what I realize now was probably meant as an impossible question, with no expectation of an answer coming from the students. The question: What is one divided by two? I came up with 1/2, but don't ask me how."

By sixth grade, Knoderer was placed in a special advanced class. These classes continued through high school, getting him into college calculus before graduation.

While Knoderer was in high school, his father was attending Indiana University. The lab where he worked just happened to be next door to the computer center. Knoderer would accompany him to campus, then hang around the computer room, going through all the thrown-away punch cards, sorting them by color and whether or not they were plain or punched. Then, in his senior year, Knoderer joined a computer club and gained some hands-on experience.

His first course in college was computer programming (in FORTRAN). This gave him a user number for the college computer, a CDC 6600. On Friday nights when most people were out on dates, Knoderer would be in the computer room until early morning, writing and running programs, experimenting and learning as much as possible.

Ronald H. Bobo, 3246 Gravois, St. Louis, MO 63118.

Besides FORTRAN, he took courses in COBOL and Systems Analysis by Computer.

"Because I was a business major," he says, "I think I have learned more about computers than I ever would have otherwise, because there is so much you can do with a computer in business if you know the business aspects. A lot of programmers do not understand the field of business, nor do most people in business understand programming."

Into the Classroom

After college came a job as an elementary school teacher in Leavenworth, KS. Not surprisingly, Knoderer used a computer in his classrooms.

He ordered a TRS-80 the same day he found out it existed, in August 1977. It was finally delivered in November. In the meantime, though, open house was coming up at the school in October, and Knoderer thought it would be wonderful if his computer could be on display.

He wrote a letter to Lewis Kornfeld, Radio Shack's president. Knoderer's computer didn't arrive in time, but Kornfeld arranged to have the regional manager supply a demonstrator unit. They flew it in from Denver, and Knoderer had it for three days.



Part of the left wall at COMP-U-TRS, showing software offerings from Instant Software and other publishers.



Front of COMP-U-TRS, conveniently located next to a Radio Shack Computer Center.

Knoderer wrote CAI (computer-aided instruction) programs for the TRS-80 during his two years of teaching. Don't be surprised to see them show up on the market one of these days.

During his second year, Knoderer decided that the pressures of teaching were not for him. When the principal, who had originally hired him because of his computer background, said he didn't think the school board was going to approve a permanent computer project, Knoderer gave notice that he would not be back the following term.

Meanwhile, Knoderer had been attending meetings of a TRS-80 users' group in Kansas City. Gradually, members began to seek him out for help with programming problems. A friend suggested that he should be getting paid for these services, and the idea for the consulting and programming service was born.

Knoderer left his teaching job in April 1978 and started his travels, his TRS-80 riding along in the back of a Vega. By May he had enough commitments from customers to justify ordering a custom-designed van. It arrived in June, and Computervan, Inc., was officially launched.

COMP-U-TRS Takes Off

COMP-U-TRS started up in August. At first, the store sold software only for the TRS-80s. Knoderer had just received his Model II, probably the first one sold in the St. Louis area, and was happily writing software for it. But COMP-U-TRS hadn't been open long before people were requesting programs for the Apple and PET.

Knoderer deliberately chose the location next to the Radio Shack Computer Center. This was a wise decision, since there has been a remarkable paucity of software from the Shack.

In spite of some early apprehension from the Computer Center people, this proximity probably helps both businesses. Knoderer refuses to sell computers, so all potential computer buyers are referred next door. Conversely, when Radio Shack has recommended a particular computer model and the customer approaches COMP-U-TRS for software information, John's employees are under orders not to suggest another model.

Knoderer fears, however, that the name may have to be changed. He has been getting some static from Radio Shack, and they've refused to accept his listing in their forthcoming roster of independent software suppliers because of the TRS in the store's name.

In Knoderer's opinion, he has probably generated around $20,000 worth of business for Radio Shack by being in his present location.

Needless to say, several TRS-80 Model I's are on hand, as well as a Model II. Knoderer has recently installed an Apple II, and a PET is available part-time for program demonstrations.

Company policy states that a po-

tential customer is free to try any software before buying, using one of the available systems. Systems may also be rented for such in-store uses as game playing, for a nominal charge of $2 per hour and $1 for each program used. The money may then be applied toward a software purchase.

The in-house stock includes software from all the major publishers and many offerings from smaller companies. The store carries a sizable selection for Apple and PET. In addition, a large selection of computer magazines and books is on hand.

Knoderer sells some disk drives and printers, but this is the extent of the hardware. He says that if he were to sell computers, or take commissions for selling them for others, he might become biased toward one type of machine. Besides, he feels there is more money to be made in the software and consulting end of the business.

Not All Roses

What are some of the problems?

For one thing, people sometimes want to use the systems, but don't buy anything. Hopefully, the hourly charge will discourage this.

"And," he says, "there's the person who buys only a blank tape before using a machine. I then have to wonder if he's saving programs.



John Knoderer, owner of Computervan and COMP-U-TRS, at the custom programming position in Computervan. Note disk drive at left and Base 2 printer on shelf. Shelf was actually designed to accommodate a Line Printer I.

Probably I'll have to rearrange the leads on the machines so it won't be possible to save a program to tape."

Another problem is that the business was slow to show a profit. The Computervan operation subsidized the store during the first several months of operation.

Any other drawbacks?

"It takes some serious thinking to decide whether to exhibit at a show. Take the Amateur Radio and Computer Hobbyist convention held in St. Louis recently. To really do it up good, I took all my employees. We sold about $2000 worth of merchandise, but it cost $2500 to attend! On the other hand, a lot of people now know we're here who didn't before."

Looking Ahead

Once the store becomes wildly successful, will John give up his mobile programming service?

"No," he says. "I want the store to become successful enough so that Ben, my manager, is making more money than he knows what to do with. This will give me the freedom for more programming. Also, there are several more aspects of the computer business in which I may become involved. Right now I have a friend who wants to start a wholesaling operation and I'm looking into that."

John is also making plans for his next van, which will be larger (something like a motor home, I suspect). Plans call for this one to have a self-contained power unit so John can be programming, if he wants, while someone else drives.

What will the recession do to the computer business?

John thinks it may hurt the sale of new computers somewhat, but computer owners will still be buying programs.

"I haven't noticed any decrease in the number of customers so far, and they all seem to have money. Credit restrictions may slow down hardware sales. One of my customers recently wanted to obtain a Spinwriter but couldn't get a lease approved."

Drawbacks notwithstanding, it appears that the potential for profit should be great in this type of store, as long as some judgment is used so that markets don't become saturated. Any fairly large city should be able to support at least one establishment similar in concept to COMP-U-TRS.

Everyone, of course, will not locate next door to a Radio Shack. Locating somewhere other than a shopping center would keep overhead down, and perhaps a few judiciously placed ads could bring in a fair amount of mail order business.

John Knoderer has already proved that money can be made by the experienced TRS-80 programmer, as evidenced by the success of Computervan, Inc. Programming and consulting, of course, need not be confined to the TRS-80. If your expertise lies elsewhere, the same business could undoubtedly be implemented using any other widely sold microcomputer.

These two types of businesses would probably be successful in many parts of the country. Who will be the next entrepreneurs?■

apple®

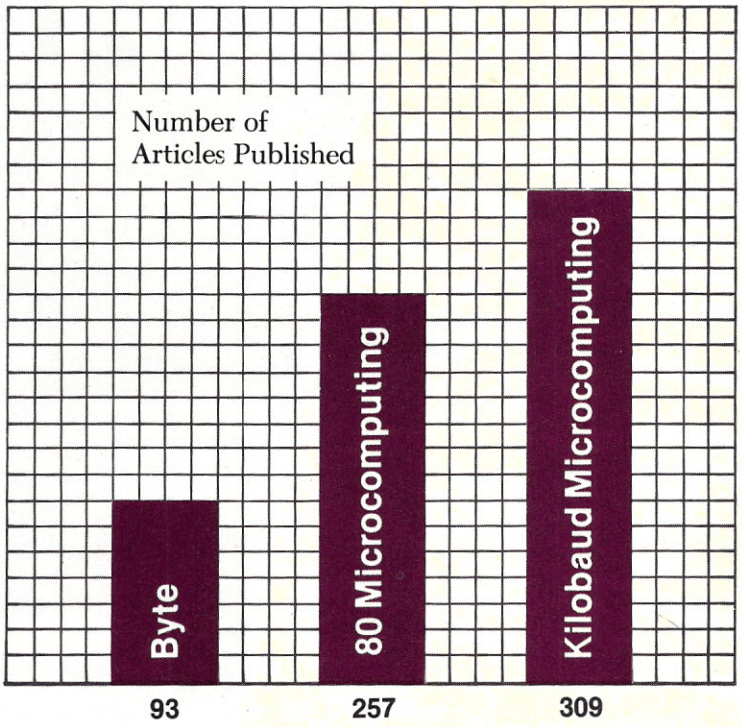
Disk Based System: Apple II or Apple II Plus with 48k RAM installed. Disk II with controller, RF Modulator; NEW DOS 3.3 ..... only $1799
Shipped free continental U.S.
Buy a 16k Apple II or Apple II Plus for $1195; get 32k more memory, installed, and RF modulator, FREE!
Apple Silentype® Printer $595; includes 10 rolls paper, free!
DOS 3.3 Upgrade Kit $60
Buy D.C. Hayes Micromodem II® for $379.95, get the new $95 Apple Dow Jones News and Quotes Reporter FREE!

VISA (800) 621-5802 master charge

ERICKSON COMMUNICATIONS ✓254
Chicago, IL 60630
5456 North Milwaukee Ave.
(312) 631-5181 (within Illinois)

DO YOU WANT MORE FOR YOUR MONEY ?

Then you may want to look at these statistics on the number of articles published in the top three microcomputing journals.



(Figures based on counts made from January 1980 to September 1980)

For $25.00 a year Kilobaud Microcomputing offers you more articles (programs you can use that are technically written for the newcomer to computing) than any other microcomputing journal.

And remember that it is solely through magazine articles that you can keep up with the state of the art. Books are a year behind. Only through magazines can you have an invaluable encyclopedia of microcomputing information. Kilobaud Microcomputing has published 1148 pages of articles to date this year—for $25.00 that's a lot of information.

☐ Yes! Bill me for one year/$25.00 311B7

Name _____

Address _____

City _____ State _____ Zip _____

Canadian $27/1 year only, US funds. Foreign $35/1 year only, US funds. Please allow 4-6 weeks for delivery.
Kilobaud Microcomputing ● Box 997 ● Farmingdale N.Y. 11737

kilobaud
MICROCOMPUTING T.M.

YOU CAN COUNT ON US

Buy Only From a "Factory Authorized Source"

THE STOCKING SOURCE



List Price Your Cost

PRINTERS — The printer you have waited for —

NEW — Epson Model MX-70 ..... $ 495. Ask For Our Price

Features: 80 C.P.S.
Unidirectional
Bit Plot Graphics
Adjustable Paper Sprocket from 4" - 10"
(All Epson Interfaces are compatible)

Epson Model MX-80 $ 645. Ask For Our Price

Okidata Microline 80 $ 800. ~~$699~~ Ask For Our Price

Okidata Microline 82 $ 960. Ask For Our Price

Features: 80 C.P.S.
Bidirectional
Full Forms Control
Choice of Parallel or Serial Interface as Standard

Anadex DP-9500 & DP-9501 ..... $1650. Ask For Our Price

Anadex DP-8000 ..... $1095. ~~$995~~ Ask For Our Price

INTERFACES —

Epson Apple Plug-in Interface & Cable ..... $110.

Epson Serial Interface & Cable ... $ 90.

Epson IEEE 488 Interface & Cable . $ 80.

Model TRS-80 INTRA Cable for Above Printers to TRS Expansion Interface Cable ..... $ 35.

Model 232 Universal CA Cable, Universal Serial Interface ..... $ 25.

Okidata Microline 80 Tractor ..... $100.

Okidata Microline 80 RS-232 Interface with 256 Character Buffer ..... $200.

FURNITURE — We stock Systems Furniture tables.

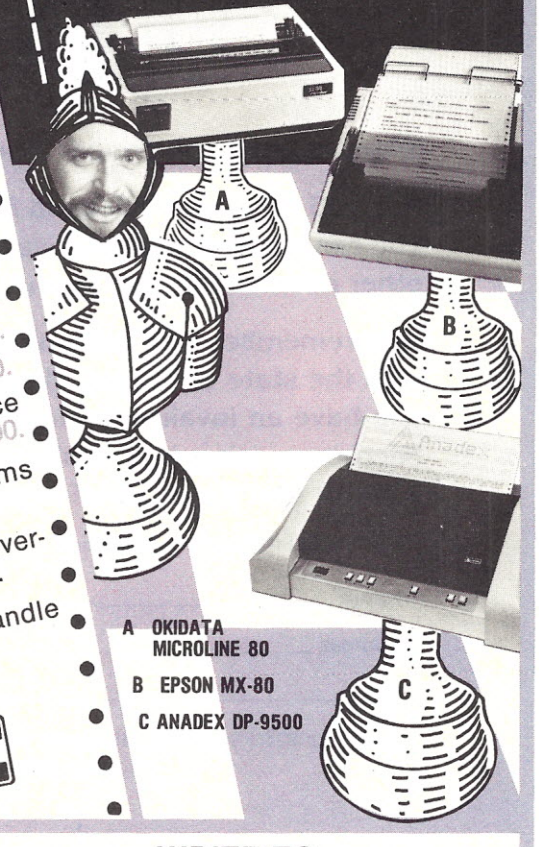
PRINTER STANDS — We stock Universal printer stands for most printers.

COUPLERS & MODEMS — We handle the broad Tek-Com line.

Bill Sez: Don't gamble! Buy only from a Factory Authorized Source.

Roy Sez: Right! The customer receives trained authorized service along with interface information.





A OKIDATA MICROLINE 80
B EPSON MX-80
C ANADEX DP-9500

master charge VISA

ASK FOR OUR INSTANT DISCOUNT
From Roy Hawthorne
Talk To Bill Tokar On Applications

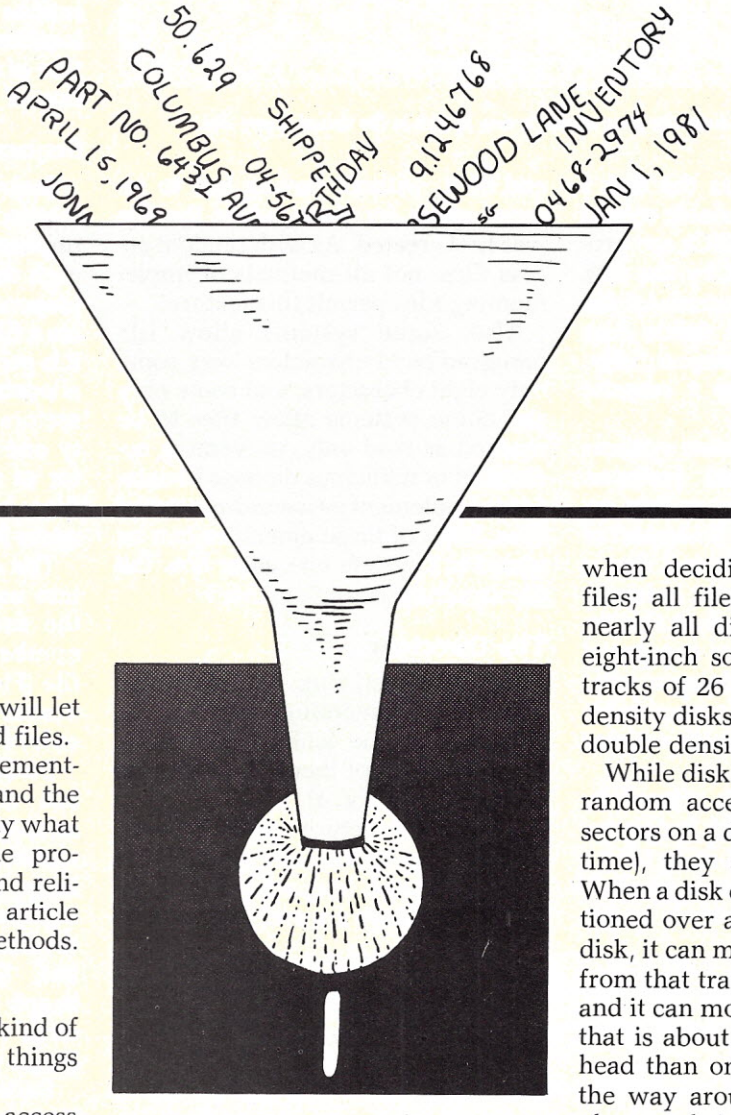
CALL TOLL FREE
U.S.A.
1-800-521-2764
MICHIGAN
1-800-482-8393

Reminder:
We are open
8:30 AM to 5:00 PM EST
Monday through Friday

WRITE TO:
"The Stocking Source" ✓288
23995 Freeway Park Dr.
Farmington Hills, MI 48024
313-474-6708

A look at the three commonly used methods of disk space management.

Data on Disk: Implementing File Systems



By Richard Fritzson

Any disk operating system will let you create and use named files. However, files can be implemented in several different ways, and the method used can affect not only what features are available to the programmer, but also how fast and reliable the disk storage is. This article looks at the details of three methods.

Disks

Every year, it seems, a new kind of disk is marketed. But some things about disks never change.

Each has a smallest unit of access called a sector; you cannot read or write anything smaller than one sector at a time. Sectors vary in size from 128 bytes to more than 1024; one system uses a sector size of 3584 bytes. The sectors are arranged on concentric tracks on the surface of the disk. The number of sectors on each track depends on the size of the disk and, of course, on the size of the sector.

Neither the sector size nor the total disk size makes much difference when deciding how to implement files; all file systems will work on nearly all disk types. The popular eight-inch soft-sectored disk has 77 tracks of 26 sectors each. On single density disks a sector is 128 bytes; on double density disks it's 256 bytes.

While disks are often referred to as random access devices (that is, all sectors on a disk can be read in equal time), they are only semi-random. When a disk drive's read head is positioned over a particular track on the disk, it can more quickly read sectors from that track than from any other, and it can more quickly read a sector that is about to pass under the read head than one that has to travel all the way around the disk. This fact plays a role in determining how to allocate files.

When a programmer asks you (the system) to create a file, how do you decide which sectors of the disk to give him?

Files

Disk files give the programmer a chance to associate a symbolic name (such as LEDGER or STARTREK) with a part of the disk. Each file consists of a series of records of a fixed

Richard Fritzson, 25 Callodine Ave., Amherst, NY 14226.

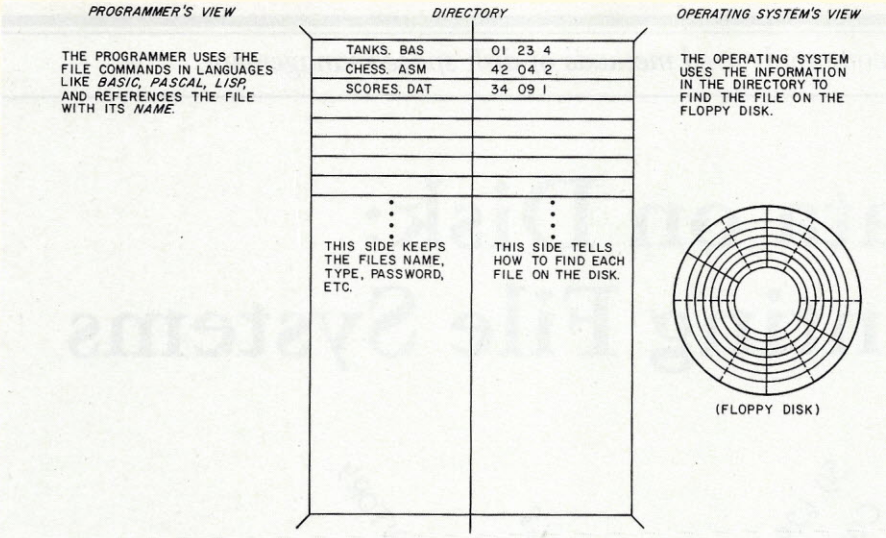


Fig. 1. The directory links the programmer's view of files to the actual floppy disk.

size, usually the same as the disk's sector size. (Note that variable record sizes found in some BASICs are provided by BASIC and not by the disk operating system.) All systems let the programmer create and delete files and read and write data sequentially, as though the file were a cassette tape.

Beyond these basics, some systems provide other important features. Foremost among these is random access to the data in a file. Since part of a disk's power lies in the fact that it does let you read any sector independently of all the rest, a system that restricts access to its files to sequential reading and writing is doing a great disservice to the user. No reasonable form of database can be built without random access files.

Another useful feature offered by some systems is the ability to dynamically expand a file; that is, to take a file that has already been created, open it and add new records to the end of it, without having had to reserve space for them when the file was first created. As with random access files, not all methods of implementing files permit this feature.

Also, some systems allow file names to be 11 characters long, some only eight characters, and some only six. Some systems allow files to be marked as read-only, preventing accidental or malicious damage to data. Some implement password-protected files. Most of these amenities can be added to a system no matter how the file structure is implemented.

The Directory

Before describing the different ways of implementing disk files, we should take one look at something common to all of them—the disk file directory (see Fig. 1).

This data structure resides on each disk and can be logically divided into two parts: one keeps track of how many files there are and their names (along with their types, passwords, etc.), while the other keeps track of where each file actually is on the disk. Naturally, exactly what information is stored in the second part depends on how the files are implemented. The method of describing the location of each file's sectors comes after you have decided how to solve the main problem of managing files: when a programmer asks you (the system) to create a file, how do you decide which sectors of the disk to give him?

There are three commonly used solutions to this problem: sequential allocation of disk space, linked allocation of disk space and mapped allocation of disk space.

Sequential Allocation

Sequential allocation is the easiest method of disk space management to implement. All you do is number each sector on the disk from 1 to N (depending on the disk size). To create a file, you have to specify how big it is going to be. The operating system allocates the requested number of sectors beginning with the first empty one and continuing, sequentially, for as many as needed. Once a few files have been created, the disk space looks something like Fig. 2a.

The directory for this type of system usually contains the number of the first sector of the file and the number of sectors allocated for the file (Fig. 3). The system can find the next available sector by looking at the entry for the last file.

Besides its simplicity, this method has other advantages. Given the semi-random nature of disk access mentioned earlier, a system that keeps all of the sectors of a file close together will provide faster access to the data in the file than one that does not. Sequential allocation always keeps all of the sectors of a file as close together as possible. This produces very fast disk I/O.

Furthermore, because the directory contains all the information needed to find any requested record of a file (the first record is listed there; to find the second one just add one to the number listed, to find the third record add two, and so on), files allocated this way can be accessed randomly. Any sector of a file can be read or written without having to first read all earlier sectors.

However, the simple method is not always best. Sequential allocation has some serious defects. For one

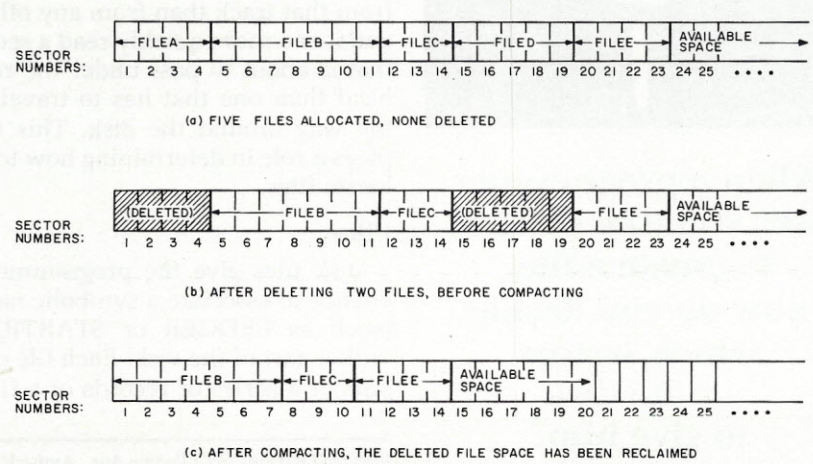


Fig. 2. Sequential allocation of disk space.

FILE NAME	FIRST SECTOR	FILE SIZE
FILEA	1	4
FILEB	5	7
FILEC	12	3
FILED	15	5
FILEE	20	4

Fig. 3. Typical file directory for sequential allocation method.

thing, it is impossible to dynamically expand a file. Fig. 2a shows that there is no way you can add records to the end of FILEA—at least, not without reading and rewriting every record of files B, C, D and E.

A more serious problem shows up when trying to reclaim available disk space. After the creation and deletion of several files, a disk will look something like Fig. 2b. While a clever system may be able to use the deleted file areas for the creation of small files, in the end there is nothing to do except squeeze out the deleted spaces by moving every file down toward the beginning of the disk, leaving all of the empty space at the end of the disk (Fig. 2c). This process is called compaction or squashing. It is a major operation, since it involves reading and writing every record of every file while moving the disk's head back and forth over the surface of the disk. On large Winchester disks it takes a long time. It increases wear and tear on both the individual disk and the disk drive.

If a disk or drive is in marginal condition, this process will often turn up an error. Because the disk is in an intermediate state during the process, with half the space compacted and half not—even half a file moved and half not—this is one of the worst times to get a disk error. Systems with two disk drives can reduce the danger by compacting from one disk to another, but that only partially reduces the wear and tear on the system.

Still, the simplicity of this method makes it popular. The North Star DOS allocates its files in this way; so do the UCSD-Pascal and Ohio Scientific operating systems.

Linked Allocation

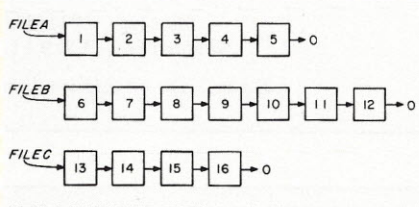
Attempting to remedy the problem of reallocating unused disk space has led some to linked allocation of disk space. In this method, the sectors of the disk are not viewed as an array of sectors, but rather as a linked list of sectors. This means that each sector contains a number or pointer that is the number of the next logical sector in the file. This number is sometimes, but not necessarily, the next physical sector on the disk (Fig. 4a).

A file in this system is a linked list of sectors ending with a sector with a special "end of file" pointer. All of the unused sectors are kept in one linked list. Whenever a new file is to be created, its sectors are taken from the list of unused sectors. With this type of allocation, the directory entry for each file contains the first sector of the file, and often the last sector as well (Fig. 5). (Even though the last sector can be found by following the links from the first one, it is often convenient to be able to find it quickly. Also, some systems link the sectors of a file both forwards and backwards.)

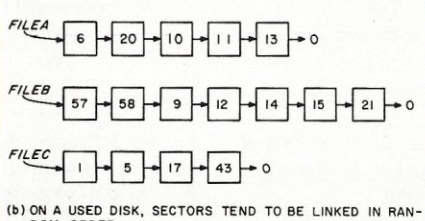
This method takes care of the two problems of sequential allocation. Reusing the space from a deleted file is now easy; you just attach the list of sectors from the deleted file to the list of unused sectors by pointing the end of the unused sector list to the beginning of the deleted file. Eventually, the sectors will be reallocated; there's never any need for compacting the disk.

Furthermore, it is now easy to dynamically expand a file: you just get some unused sectors from the free list and hook them to the end of the file. You can, if you want, dynamically shrink files and reuse those sectors as well.

But—and this is a very big BUT—



(a) ON A FRESH DISK, SECTORS ARE OFTEN LINKED SEQUENTIALLY



(b) ON A USED DISK, SECTORS TEND TO BE LINKED IN RANDOM ORDER

Fig. 4. Linked allocation of disk sectors.

FILE NAME	FIRST SECTOR	LAST SECTOR
FILEA	6	13
FILEB	57	21
FILEC	1	43

Fig. 5. Typical file directory for linked allocation method.

linked allocation introduces problems of its own. After creating and deleting files for a while, the order in which sectors are allocated is not at all related to their actual order on the disk (Fig. 4b). This means that while simply reading sequentially through a file, the disk head will move back and forth all over the disk, slowing down access to the data and increasing wear on the disk and drive.

Worse, with linked allocation, there is no way to perform random access to the records of a file. The only way to find the tenth sector of a file, for example, is to find the pointer from the ninth sector, the only way to find the ninth sector is from the eighth and so on. You always have to read through a file to find a particular record. Not even the systems that link the file both forwards and backwards help solve this problem.

Because of this, linked allocation is not used that often.

Mapped Allocation

The method of disk space allocation that comes closest to ideal so far is mapped allocation. Even though it is used by some very popular operating systems (e.g., Digital Research's CP/M and the derivative systems such as Cromemco's CDOS), it is not widely understood. It's a little more complicated than the other methods.

In its simplest form, mapped allocation means that the directory contains, for each file, the sector number of every sector in the file (Fig. 6). This array of sector numbers is a map of the file; hence the name of the method. To read the fifth record of a file, for example, the system looks at the fifth number in the map for the file and reads that sector.

Unlike the other methods, the mapped allocation scheme does not maintain on the disk some indication

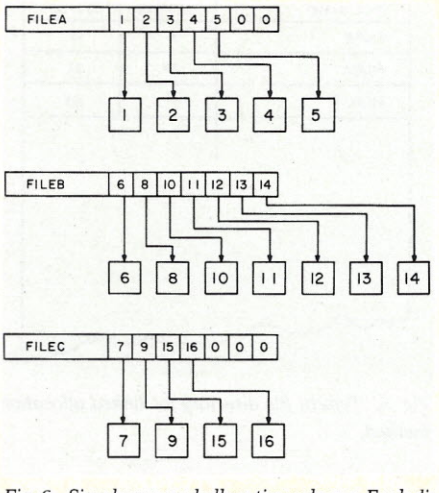


Fig. 6. Simple mapped allocation scheme. Each directory entry points to the sectors of the file.

of which sectors are unused and available for new files. Instead, each time the system sees a new disk, it goes through a logging in or registering process. This involves reading the entire directory and building a bit map of the disk's sectors (Table 1).

A bit map is an array of single bits, each one of which corresponds to a sector on the disk. If a sector is in use in some file, its corresponding bit is set to one; unused sectors have their corresponding bits left as zero. The bit map (sometimes called an allocation vector) is then used to find and allocate available disk sectors.

Like the linked allocation scheme, mapped allocation systems can dynamically reuse deleted file space. Whenever a file is erased, the system reads its directory entry and resets the bits corresponding to each of its sectors to zero, thus making them available for use. No compaction process is ever needed. And, like linked allocation, mapped allocation allows for dynamic expansion of files. New blocks can be found in the bit map and added to a file's directory entry when needed.

Unlike linked allocation, this method allows random access to disk files. Since all of the records of a file are listed in the directory entry, any one of them can be found instantly. And while the sectors of a file can wind up spread out on the surface of the disk (as in the linked method), this problem is minimized by the use of the bit map to allocate available sectors that are adjacent to or near one another. (This information is not easily available from the linked list of available sectors in the linked allocation method.)

Mapped allocation would seem to be the ideal way to implement files except for one thing: it's not quite as simple as I've described.

First, since a file can have thousands of records, a directory entry which listed out the address of each sector would be much too large to be acceptable. For example, a file with 128 records, assuming 16-bit addresses, would require a directory entry of 256 bytes for just the allocation information.

The solution to this problem is to allocate the disk's sectors not one at a time, but a bunch at a time. That is, instead of assigning a number to every consecutive sector on the disk, number consecutive blocks of, say, eight sectors. Now each number in a directory entry's map stands for a block of eight sectors.

You don't have to read and write the file in blocks of eight sectors, though. Since the sectors within a block are all adjacent, a simple calculation from the block number tells you where the first sector is, and the other seven are the ones right after that one. You can still do random access to individual sectors of a file.

This trick reduces the number of addresses needed for each file's map to an eighth of what was needed before. It also has another good effect. A typical floppy disk has 2002 sectors (77 tracks of 26 sectors each), and so about 250 blocks of eight sectors. The first number requires two bytes, but the latter only requires one; this cuts the file's map size in half again. The 128-record file can now be mapped with only 16 bytes instead of 256. For just a little extra computation, the map size is now reasonable.

The second problem with mapped allocation is that directory entries in all disk systems usually have a fixed size, the same for each file. Sequential allocation directories keep a pointer and a sector count; linked directories keep one or two pointers. The file size doesn't affect the directory size. For mapped allocation you either have to deal with a complicated disk directory with entries whose sizes vary from file to file and change with time, or you have to fix a comfortable maximum size for every file and give each file that much directory space whether it needs it or not.

The solution is to do neither, or both. Fix the directory size to allow some reasonable maximum file size. The example (which is the old CP/M's standard way of doing things) is to allow up to 128 records per file. This keeps the directory entries reasonably small. But, whenever a file needs to be larger than the maximum size, just give it additional directory entries, as many as it needs.

To keep things in order, you number the individual directory entries associated with a file (e.g., FILEA1, FILEA2). In CP/M terminology each of these entries represents an extent

Bit Map:	00111111 01011100 11111100 . . . .
Sectors Free:	1,2, 9,11,15,16, 23,24, ...

Table 1. The bit map is a tight encoding of the available sectors.

Attribute	Sequential Allocation	Linked Allocation	Mapped Allocation
Random access files	Yes	No, only serial access.	Yes
Dynamic expansion of files	No, file size is fixed at creation.	Yes	Yes
Automatic reallocation of deleted files	No, Periodic compaction is required to recover available space.	Yes	Yes
Performance	Very good. Keeps all blocks from each file together. Minimizes head movement.	Not good. Related blocks tend to be scattered across disk. Much disk head movement.	Not bad. Some scattering of related blocks, but bit map tends to keep them together.

Table 2. Comparison of the three allocation methods.

of the file (see Fig. 7). This reduces the total number of files you can fit in a fixed size directory, but if you are building large files, you will have fewer of them anyway. Using these tricks, you get all the advantages of straight-mapped allocation without paying an extreme price in terms of directory size or complexity.

The only real disadvantage of this scheme is that it is harder to implement than the others. To find a record for a file, you need to calculate which extent it is in (if the file is larger than one directory entry can handle). Then you need to find the block it is in, calculate where the first sector of that block is, and then where the requested sector is relative to that one. All of these calculations require a trivial amount of computing time when compared with the disk access time so they do not significantly hurt performance, but they do complicate the operating system's code.

However, to the users of such a system, access is simple, random access is allowed, no periodic disk compactions are needed and file size can change dynamically. Digital Research's new CP/M 2.0 takes advantage of this scheme to let users allocate space at the beginning and end of a file, but not necessarily (if you don't want to) in the middle. All in all, mapped allocation of disk space is a very useful and flexible way to implement disk files.

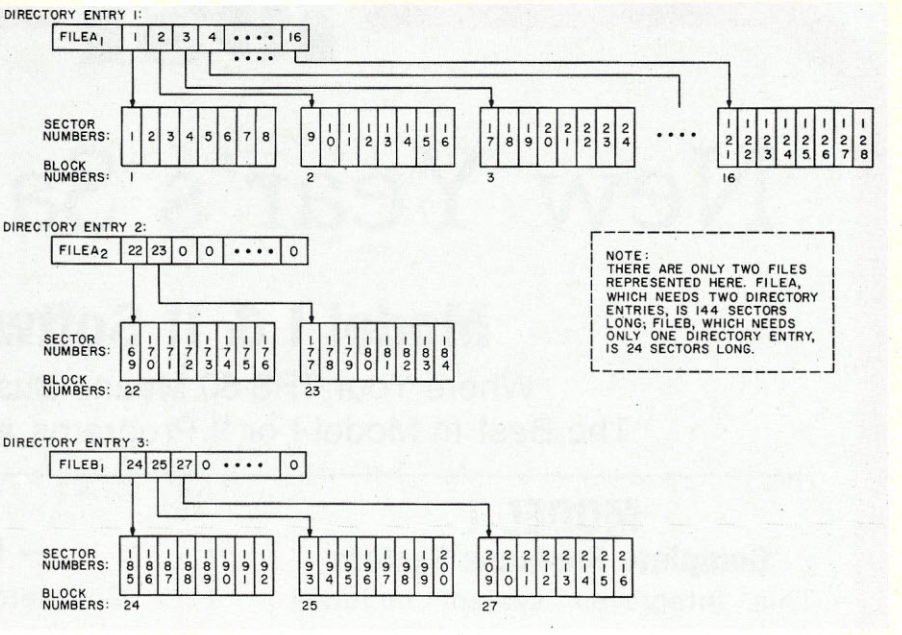


Fig. 7. Sophisticated mapped allocation scheme. Pointers are to blocks of eight sectors.

Table 2 sums up this comparison of allocation methods. It's clear that anyone trying to implement a new operating system should not use a file management system that provides anything less than the features of the mapped allocation method. ■

If you have an Apple, Pet or TRS-80 microcomputer,* you can have fantasy at your fingertips with Epyx computer games from Automated Simulations.

Like me, you're probably really into games, all sorts of games. But an Epyx game is more than a game – it's an experience, and it's a chance to use your computer for something other than work. The great thing about Epyx games is that you have a choice. Whether you're a beginner or an expert, you can find games that are easy to learn. Challenging. Fun to play for twenty minutes or hours at a time. You can play these games over and over, because you're constantly trying new tactics and strategies.

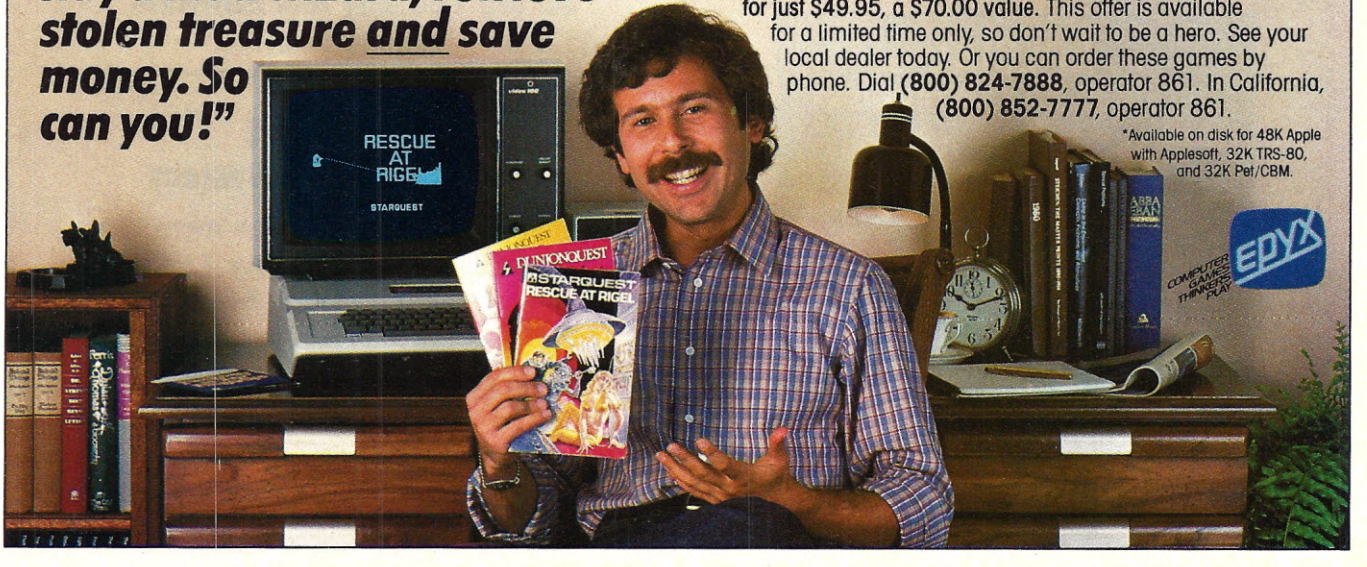
I've already entered and re-entered a world of monsters and misfits, demons and dwarves, trials, tribulations and treasures with a game called "Temple of Apshai." Now it's my chance to have fun with three more games from Automated Simulations... and I can save money, too!

With "Datestones of Ryn" and "Morloc's Tower," I get to escape from booby-trapped mazes, find more treasures and zap more monsters. And with "Rescue at Rigel," I get to outwit the nasty High Tollah and free 10 prisoners.

"I can rescue ten prisoners slay a mad wizard, retrieve stolen treasure and save money. So can you!"

Automated Simulations has a special offer on "Datestones of Ryn," "Morloc's Tower" and "Rescue at Rigel." Buy all three for just $49.95, a $70.00 value. This offer is available for a limited time only, so don't wait to be a hero. See your local dealer today. Or you can order these games by phone. Dial (800) 824-7888, operator 861. In California, (800) 852-7777, operator 861. ✓55

*Available on disk for 48K Apple with Applesoft, 32K TRS-80, and 32K Pet/CBM.



1981

New Year's Sale



Model I & II Software

Where Your TRS-80 Means Business —
The Best in Model I or II Programs Available Now!

MODEL 1
Complete Business System

This integrated system includes Invoicing, Inventory Control, Accounts Receivable, Accounts Payable, Payroll, General Ledger and Word Processing. A complete Business System for your Model 1.

SPECIAL OFFER

$299.95

MODEL II
— Business System —

Complete with all manuals. This is one of the best and most complete Business Systems for your Model II. Best of all it is easy to use. Enter the world of the Model II with a system that works!

SPECIAL OFFER

$649.95



MODEL I
Medical/Dental System

Complete System — Easy to use! Now you can use your TRS-80 where you intended to use it — in your office! Give us a call for complete details on this new Complete Package.

SPECIAL OFFER

Special $349.95

MODEL II
CP/M Release 2.2

Including Utilities and full documentation. This is the CP/M designed for the Model II.

SPECIAL OFFER $169.95

Including CBASIC-2 **$229.95**

CBASIC-2 ONLY **$79.95**

Before You Buy Any Software Call Us First!

MODEL II
Medical/Dental System

Same as above with much more! This System also includes our computer-Based Patient History System. THE BEST!

Special $699.95

★ SPECIAL ★

Verbatim 5¼'' Mini Disks

$24.50 Box (10 Per Box)

Verbatim 8'' Floppy Disks

Double Density FD34-8000)

$44.50 Box (10 Per Box)

Limit 4 Boxes Per Customer

*OFFER GOOD WHILE QUANTITIES LAST

All Programs Supplied on Diskette

New

Hotel/Motel System

$799.95

Property Management System

$549.95

MODEL II
MAGIC WAND
— Word Processing System —

This System offers the best features of any system on the market, including the best documentation.

Special $289.95

STRUCTURED SYSTEMS GROUP

General Ledger	$729.95
Accounts Receivable	$729.95
Accounts Payable	$729.95
Payroll	$729.95
Inventory Control	$429.95
Analyst	$189.95
Letterright	$165.95
NAD	$ 79.95
QSORT	$ 79.95

MICROPRO

Word Star (Ver 2.1)	$319.95
Word Star w/Mail-Merge	$459.95
Data Star	$279.95
Word Master	$119.95
SuperSort I	$189.95
SuperSort II	$159.95
SuperSort III	$119.95

MANUALS

OSBORNE/McGRAW HILL

Accounts Receivable/ Accounts Payable	$18.95
Payroll w/Cost Accounting	$18.95
General Ledger	$18.95
CBASIC 2 Manual	$12.95
Structured Systems Manual	$24.95
Graham Dorian Manual	$34.95
Magic Wand Manual	$34.95
Word Star Manual	$34.95
CP/M Handbook (Sybex)	$12.95

GRAHAM-DORIAN

General Ledger	$679.95
Accounts Receivable	$679.95
Accounts Payable	$679.95
Payroll	$479.95
Inventory Control	$479.95
Invoicing/Order Entry	$679.95
Cash Register	$479.95
Apartment Management	$479.95
Job Costing	$679.95

Looking for a Specific Program at the Best Price — Call Us Today!
Thinking Business - Take Advantage of these Limited Offers.

We now handle software to support many microcomputers other than the TRS-80*

Software-Mart ✓322

24092 PANDORA STREET
EL TORO, CALIFORNIA 92630

24 HOUR HOT LINE

(714) 768-7818 (in California)
1-800-854-7115

SOURCE MAILBOX: TCU155

MicroNET™ Electronic Mail: 70341, 103

Give us the Opportunity to Beat any Nationally Advertised Price!

"OUR BEST AD'S ARE NOT WRITTEN — THEY'RE RUNNING ON TRS-80's"

*Quantities limited on some items ● TRS-80 is a trademark of Radio Shack ● Magic Wand is trademark of Small Business Applications ● CP/M is a trademark of Digital Research, Inc. ● MicroNET is a trademark of CompuServe ● All Software is sold on an "as is" basis and without warranty ● Prices and programs are subject to change without notice ● Add $2.00 shipping & handling on each order

OFFER EXPIRES 3/31/81

Use your micro for programmed timing of multi-step processes, such as photo processing.

TRS-80 in the Darkroom

By David Busch

Program listing. Process program for the TRS-80.

```
1 'PROCESS
    David D. Busch
    515 E. Highland Avenue
    Ravenna, Ohio 44266
10 CLEAR 400
20 DIM STP$(20),AG$(20),MN$(20),SEC$(20),CHEM$(20),TEMP$(20)
30 GOSUB 1260' Pokes sound program into memory
40 GOTO 70
50 A$=INKEY$:IF A$="" GOTO 50
60 RETURN
70 CLS:PRINT:PRINT
80 PRINT "Would you like to:"
90 PRINT
100 PRINT"       1.)  Enter specs for a new process"
110 PRINT"       2.)  Run a process stored on disk"
120 PRINT
130 PRINT "          Enter choice :"
140 A$=INKEY$:IF A$="" GOTO 140
150 IF VAL(A$)<1 OR VAL(A$)>2 GOTO 140
160 ON VAL(A$) GOTO  190,460
180 '**************************************
        Input Process Instructions
     **************************************
190 CLS:PRINT:PRINT
200 INPUT "How many steps are there in this process";STP
210 FOR N=1 TO STP
220 PRINT"Name of step #";N;:INPUT STP$(N)
230 INPUT "Enter chemical needed for this step";CHEM$(N)
240 PRINT "Does the ";STP$(N);" step  require agitation";:INPUT ANS$
250 IF LEFT$(AN$,1)="Y" THEN INPUT "Enter how many seconds between
 agitation";AG$(N) ELSE AG$(N)="None"
260 PRINT "How many minutes,seconds for this step.  Minutes";
:INPUT MN$(N):INPUT "Seconds";SEC$(N)
270 INPUT "Temperature required for the time given";TEMP$(N)
280 NEXT N
290 CLS:PRINT:PRINT
300 PRINT "Would you like to save this process instruction";:INPUT AN$
310 IF LEFT$(AN$,1)<>"Y" THEN RUN
320 '**************************************
        Save Instructions
     **************************************
330 INPUT"Enter a file name for this process :";F$
340 OPEN "O",1,F$
350 PRINT #1,STP
360 FOR N=1 TO STP
370 PRINT #1,STP$(N);",";
380 PRINT #1,AG$(N);",";
390 PRINT #1,MN$(N);",";
400 PRINT #1,SEC$(N);",";
410 PRINT #1,CHEM$(N);",";
420 PRINT #1,TEMP$(N)
```

More →

A photographic darkroom is not an ideal environment for a microcomputer—and a computer room is not the best place to develop film. But for hobbyists with multiple avocations, the two activities can co-exist if the space is kept clean, and if noxious chemicals are confined to a "wet" area away from the computer.

In several ways, a typical photographic process resembles a computer program. Certain steps, meeting a list of conditions, are carried out in a predetermined order. If other conditions arise during the "program" (e.g., the temperature starts to drop during a color process), the activity "branches" to a subroutine (adjust thermostat or raise temperature of water bath).

Process was written to permit the TRS-80 to function as a programmable timer-process instruction device. With the screen brightness turned down, and, perhaps, with a suitable 12-inch diagonal filter placed over the glass, the computer can be used even for color processes calling for total darkness or a dim safelight. The Process program provides an audible signal, thus making constant moni-

David Busch, 515 E. Highland Ave., Ravenna, OH 44266

toring of the CRT unnecessary.

The Program

This program's features include:

- Instructions for processes with up to 20 steps may be entered by the user and stored on disk.
- These steps can include directions on chemicals to be used, temperature for each step, length of time and the interval between agitation, if any.
- Both elapsed time and amount of time required for the step are displayed on the video screen.
- When an amplifier is plugged into the tape output of the TRS-80, audible signals are given at the start and end of each step, as well as the points when agitation is necessary.
- At the beginning of the process, a list of chemicals required and temperatures for each step is listed. The user is told at the end of each step which chemical should be used next.
- The user can wait between steps. If he needs to go to the bathroom while a roll of film is sitting in the stopbath, he can.

Process uses NEWDOS+, which lets you turn the TRS-80's real-time clock on and reset it to zero without exiting BASIC. TRS-DOS users can adapt the program by using whatever value of TIME$ is returned at the start of a step as a basis for comparing for elapsed time. I found it much easier to work from 00:00:00 by resetting the clock at each step. (NEWDOS 80 users should change line 780 to read: 780 TIME, 00:00:00.)

Instructions are input and saved to disk through lines 180–450. The information is stored in six arrays: STP$(N), AG$(N), MN$(N), SEC$(N), CHEM$(N) and TEMP$(N). These store data for the name of the step, agitation interval, if any, minutes, seconds, chemical used and temperature for N steps in the process. I dimensioned the arrays for 20 steps, and this can be increased by the user, but the tendency in photo technology has been to simplify processes. Color print processing has been cut from seven steps to two or three in the last 15 years.

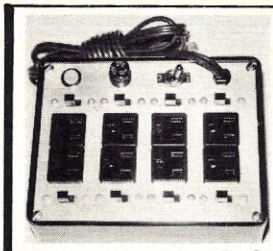
To run a process, the user retrieves the desired instructions from the disk, using the appropriate file name that was given when the process was saved. TRI-X, E-6 or EKTA2 might be typical examples. When the file is loaded, the progam in line 590 automatically turns on the clock.

The process itself is run in lines 610–1170. A list of steps and chemi-

Listing continued.

```
430 NEXT N
440 CLOSE 1
450 GOTO 70
460 CLS:PRINT:PRINT
470 '*************************************
       Load Process from Disk
     *************************************
480 INPUT "Enter file name for desired process";F$
490 OPEN "I",1,F$
500 INPUT #1,STP
510 FOR N=1 TO STP
520 INPUT #1,STP$(N)
530 INPUT #1,AG$(N)
540 INPUT #1,MN$(N)
550 INPUT #1,SEC$(N)
560 INPUT #1,CHEM$(N)
570 INPUT #1,TEMP$(N)
580 NEXT N
590 CMD"CLOCK"
600 '****************************
       Run Process
     ****************************

610 '------- Print list of steps ------
620 CLS:PRINT:PRINT
630 PRINT " The followins steps are to be followed :"
640 PRINT "Step","Chemical","Temperature"
650 PRINT
660 FOR N=1 TO STP
670 PRINT STP$(N),CHEM$(N),TEMP$(N)
680 NEXT N
690 PRINT
700 PRINT "Press any Key. Pour chemical when you get"
710 PRINT "sound or visual signal."
720 GOSUB50
730 CLS
740 '------ Run each step ------
750 FOR N=1 TO STP
760 PRINT:PRINT:PRINT"Resetting clock to zero."
770 PRINT:PRINT:PRINT "Pour chemical at signal."
780 CMD"TIME=00:00:00"
790 CLS:PRINT:PRINT
800 H4=20:GOSUB1180
810 PRINT "Pour ";CHEM$(N);" now."
820 FM=0:FS=0:FH=0:AFLAG=0
830 AG=VAL(AG$(N)):IF AG<>0 THEN AFLAG=1' Is asitation needed this step?
840 '------ Format time required this step ------
850 IF VAL(MN$(N))=0 THEN MN$(N)="00":GOTO 880
860 IF VAL(SEC$(N))=0 THEN SEC$(N)="00"
870 IF VAL(MN$(N))>0 AND VAL(MN$(N))<10 THEN MN$(N)="0"+MN$(N)
880 IF VAL(SEC$(N))>0 AND VAL(SEC$(N))<10 THEN SEC$(N)="0"+SEC$(N)
890 PRINT @ 100,"Time this step :";:PRINT @ 120,MN$(N);:PRINT @ 122,":";:PRINT @ 123,SEC$(N);
900 '------ Determine hours, minutes,seconds at finish ------
910 FS=VAL(SEC$(N))
920 IF FS>60 THEN FS=FS-60:FM=1
930 FM=FM+VAL(MN$(N))
940 IF FM>60 THEN FM=FM-60:FH=1
945 '------Test for end of allowed time ------
950 C$=RIGHT$(TIME$,8)'          C$=Current time
960 SE=VAL(RIGHT$(C$,2))'        Current seconds
980 HR=VAL(LEFT$(C$,2)):IF HR>=FH GOTO 990 ELSE GOTO 1010
990 MN=VAL(MID$(C$,4,2)):IF MN>=FM GOTO 1000 ELSE GOTO 1010
1000 IF SE>=FS GOTO 1070 ELSE GOTO 1010
1010 IF SFLAG=1 GOTO 1050
1020 '------ Asitate? -------
1030 IF AFLAG=1 THEN S1=SE/AG:S2=INT(S1):IF S1=S2 THEN SFLAG=1
1040 IF SFLAG=1 THEN PRINT @ 280," Asitate":TM=SE:H4=50:GOSUB 1180
1050 PRINT @ 280,"                ":SFLAG=0
1060 GOTO 950
1070 CLS:PRINT:PRINT
1080 H4=10:GOSUB 1180
1090 IF N=STP GOTO 1160 ELSE PRINT "The ";STP$(N);" step  is now over.  Please pour out the ";CH
EM$(N)
1100 PRINT "and prepare for the ";STP$(N+1);" step."
1110 PRINT "Have the ";CHEM$(N+1);" ready."
1120 PRINT
1130 PRINT " Press any Key when ready to continue."
1140 GOSUB 50
1150 NEXT N
1160 CLS:PRINT:PRINT:PRINT "The process is over.  Please dump the ";CHEM$(N);" ."
1170 GOTO 1170
1180 '****************************
          Sound
     ****************************
1190 POKE 32737,5
1200 FOR I=1 TO 10
1210 SO=USR0(0)
1220 FOR C=1 TO H4:NEXT C
1230 NEXT I
1240 RETURN
1250 '******************************
       Poke Sound Routine
     ******************************
1260 DEFUSR0=32736
1270 FOR N=0 TO 31
1280 READ D
1290 POKE 32736+N,D
1300 NEXT N
1310 RETURN
1320 DATA 38,100,22,1,92,14,0,62,1,0,211,255,6,16,16,254,13,40,9,29,32,246,92,47,230,3,24,237,21
,32,237,201
```



THE SPIKE-SPIKER™ with transient absorber and filters
Computer Power Console

- Protects computer equipment from most power line transients
- Provides convenience of plugging all computer equipment into one unit and simply switching the equipment on and off in required sequential order
- Provide RF "hash" filtering between computer and motorized equipment in the computer system, home or office to help prevent interference
- Eliminates constant plugging and unplugging of power cords

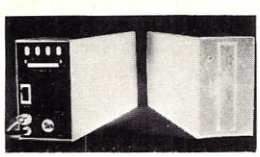
The Spike-Spiker has 8 individually switched 120 VAC outlets divided into two rows of separate filtered circuits of 4 outlets each, main on/off switch, fuse, and indicator light. Prewired and ready to use!

$59.95

Plug your CPU, interface, etc. in one filtered set of 4 outlets and your disks and printer in the other set of 4 outlets. This allows RF "hash" filtering to help prevent interference between the the computer and its peripheral motorized equipment.

KAGLO® ✓222 ELECTRONICS CO., INC.
COLONY DR. I.P.
P.O. BOX 2062, DEPT. MC
BETHLEHEM, PA. 18001
OUT OF STATE 800-523-9685
215-865-0006

SIRIUS 80+
High Performance Low Cost Floppy Add-Ons!



The SIRIUS SYSTEMS 80+ Series of Floppy Disk add-ons are designed to provide unmatched versatility and performance for your TRS-80*. Consisting of four different add-ons, there is a 80+ Series Floppy Disk Drive to meet your needs.

COMMON CHARACTERISTICS

- *5ms track-to-track access time*
- *Auto-Eject*
- *180 day WARRANTY*
- *Exceptional speed stability - 11/2%*
- *Single/Double Density operation*
- *Mix any or all 80+ Series on the SS Standard cable*

SPECIFIC CHARACTERISTICS

The **SIRIUS 80+1** -a single sided, 40 track Drive. Offering 5 more tracks than the Radio Shack model, it cost $120 less. Formatted data storage is 102K/204K Bytes Single/Double Density.
SIRIUS 80+1 ..... **$379.95**

The **SIRIUS 80+2** is a dual sided, 80 track (40 per side) Disk Drive. It appears to the TRS-80* as TWO 40 track drives yet **COST LESS THAN HALF THE PRICE!** Even greater savings result since data is recorded on both sides of the media instead of only a single side. This unit may require the SS Standard cable. Formatted data storage is 204K/408K Bytes Single/Double Density.
SIRIUS 80+2 ..... **$449.95**

The **SIRIUS 80+3** - a single sided, 80 track Drive. Offering 2½ times the storage of a standard Radio Shack Disk Drive, the 80+3 greatly reduces the need for diskettes correspondingly. Additionally, because of the increased storage and faster track-to-track access time, the 80+3 allows tremendously increased throughput for disk based programs! The 80+3 includes SIRIUS's TRAKS-PATCH on diskette (for use with 96 tpi drives). Formatted data storage is 204K/408K Bytes Single/Double Density.
SIRIUS 80+3 ..... **$499.95**

The **SIRIUS 80+4** -a dual sided, 160 track (80 per side) 5¼" monster! The ultimate in state-of-the-art 5¼" Floppy Disk Technology, the 80+4 is seen by the TRS-80* as two single sided disk drives. Thus, in terms of capacity, one 80+4 is equivalent to 4⅔ standard Radio Shack drives — at a savings of over 73% (not to mention diskettes!!!). (With a double density converter the available memory is huge!) The 80+4 (a 96 tpi drive) includes TRAKS-PATCH on diskette and may require the SS Standard cable. Formatted storage is 408K/816K Bytes Single/Double Density.
SIRIUS 80+4 ..... **$649.95**

All 80+ Series Floppy Disk add-ons operate at 5ms track-to-track but are Expansion Interface limited to 12ms for the TRS-80*

**TRS-80© of Tandy Corp.*

ACCESSORIES
SS Standard 2 Drive Cable **$29.95**
NEWDOS/80-Sophisticated Operating System for the TRS-80* from Apparat **$149.95**

Save up to 10% *with these SIRIUS Packages!*

NEWDOS/80, SIRIUS 80+3, and Two Drive Cable **$624.95**
NEWDOS/80, SIRIUS 80+4, and Two Drive Cable **$749.95**
NEWDOS/80, Two (2) SIRIUS 80+3's, Two Drive Cable **$1080.95**
NEWDOS/80, Two (2) SIRIUS 80+4's, Two Drive Cable **$1349.95**

MPI 51/52 & 91/92 STATE-OF-THE-ART DISK DRIVES

- *Fast! 5ms track-to-track access*
- *Exclusive Pulley-Band Design*
- *Unique Door/Ejector Mechanism*
- *Reliable 11/2% Speed Stability*
- *Single/Double Density Operation*
- *Industry/ANSI Standard Interface*

MPI 51 (Single Head/40 tracks)
125K/250K Bytes Single/Double Density**
..... **$259.95**
MPI52 (Dual Head/80 tracks (40/side))
250K/500K Bytes Single/Double Density**
..... **$349.95**
MPI 91 (Single Head/80 tracks)
250K/500K Bytes Single/Double Density**
..... **$399.95**
MPI 92 (Dual Head/160 tracks (80/side))
500K/1000K Bytes Single/Double Density**
..... **$524.95**
MPI Technical Manual **$6.95**
**Unformatted data storage

QUME® DataTrak 8

8" Disk Drive
DOUBLE SIDED!
DOUBLE DENSITY!

$574.95

High performance Double Sided Disk 8" Disk Drive ■ Single or Double Density ■ Door Lock and Write Protect INCLUDED! ■ Negative DC Voltage not required ■ Low Power Operation

- *FAST! 3ms track-to-track access*
- *Low friction and minimum wear*
- *Superior Head Load Dynamics*

QUME DataTrak 8 ..... **$574.95 ($549 ea)**
QUME Technical Manual **$6.95**
Connector Set #3 (AC, DC, & Card Edge) **$10.95**
Connector Set #4 (AC and DC) **$2.95**

TFORTH! -what it has to offer YOU!

TFORTH is a procedural FORTH type language which specifies a process rather than a desired result. Designed to run on the TRS-80®, TFORTH is a very powerful tool by itself or used in conjunction with Assembly Programming. A rich set of WORDS come with TFORTH and many features considered as "extra with other FORTH languages are standard with TFORTH. These features include:

- *Advanced Math Package*
- *Line Editor*
- *Macro Assembler*
- *Re-Entrant Code*
- *Super Graphics Capabilities*
- *Sophisticated User Functions*
- *140 Page User's Manual*
- *Virtual memory*
- *Interpreter*
- *Compiler*
- *Produces CMD Files*
- *Expandable*
- *And many, many other features*

TFORTH from SIRIUS comes on diskette complete for the TRS-80® with as little as 16K of memory and a single Disk Drive.
TFORTH **$129.95**

✓67 **SIRIUS SYSTEMS**
7528 Oak Ridge Highway
Knoxville, Tennessee 37921

TO ORDER CALL (615) 693-6583

Phone Orders Accepted 9AM-7PM (EST) Mon-Fri

We accept **MC, VISA, AE, COD** (requires Certified Check, Cashier's Check or Cash) and **Checks** (personal checks require 14 days to clear). **SHIPPING AND HANDLING:** $7.00 per Floppy Disk Drive or 80 - Module ■ 5% for other items (any excess will be refunded) ■ **Foreign Orders** add 10% for Shipping & Handling. Payment in U.S. currency ■ Tennessee residents add 6% Sales Tax ■ **VOLUME DISCOUNTS AVAILABLE**

cals needed is first printed out on the CRT screen. Then, a loop of N to the number of steps (FOR N = 1 to STP) begins at line 640.

Lines 840–890 format the time required for each step so that it can be displayed on the screen beneath the real-time clock's display. This routine adds zeros where appropriate, so that one minute, one second can be shown as 01:01, rather than 1:1.

At lines 950–1060 a timer subroutine is repeated until the TIME$ returned at line 950 is greater in numeric value than the time allowed for that step. Agitation at the required intervals is also activated during this portion of the program.

At the beginning of each step, and for agitation, control is sent to a subroutine at line 1180, which produces sound at the amplifier by means of a machine-language routine poked into memory when the program is first run. The signal is repeated ten times, with its sound altered by changing the value of H4, which is contained in a delay loop. The higher the value of H4, the slower the oscillation of the tone produced. This simply provides a means of letting the user differentiate between the signal used to agitate and the one that marks the end of each step.

The only bug in the program that I've been unable to overcome is the danger of spilling chemicals on the computer. Because a disk-based TRS-80 has to be the most expensive programmable darkroom timer available, I can only advise extreme caution. ■

USR-330D Modem

Auto-Dial/Auto Answer **$399**
Connect your TRS-80, Apple, or any other computer to the phone lines.

- 0-300 Baud-Bell 103/113 compatible
- Serial-RS232
- Half/Full Duplex
- 1 year warranty

FCC Certified
Direct connection to phone lines via RJ11C standard extension phone jack



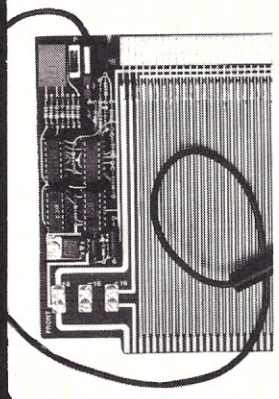
USR-330A Modem **$339**
Same as 330D
but Manual-Originate/Auto-Answer.

Radio Shack Model II Users –
We have software to connect you directly to the phone lines.

U.S. ROBOTICS INC.
203 N. WABASH
SUITE 1718
CHICAGO, ILL. 60601
(312) 346-5650
✓263

MULLEN Computer Products

S-100 EXTENDER/LOGIC PROBE

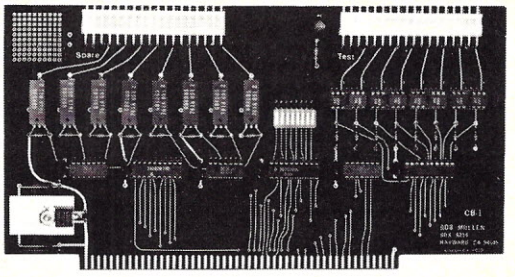


- **New** interlaced ground and signal traces, improves performance, reduces noise, with the new high clock frequency boards
- **New** brighter display, makes this very handy logic probe easier to use
- **New** proposed IEEE buss edge connector label, with all the fine quality documentation you expect with Mullen kits.
- High quality FR-4 board is double sided with plated thru holes and solder-masked for easy kit assembly
- Gold on all mating connector surfaces for better electrical contact
- Formed connector leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy
- Large "kluge" area lets you build and test your own circuits

TB-4 EXTENDER/LOGIC PROBE
$59. Kit $79. Assm/tested

S-100 CONTROLLER BOARD

- **8 reed relay - OUTPUTS**
- **8 opto-isolated - INPUTS**
- **256 selectable port addresses**



Our S-100 CONTROLLER is used in laboratories, at universities, and in industry, in hundreds of applications, and may be the answer to your control problem. Complete programming and operating instructions included.

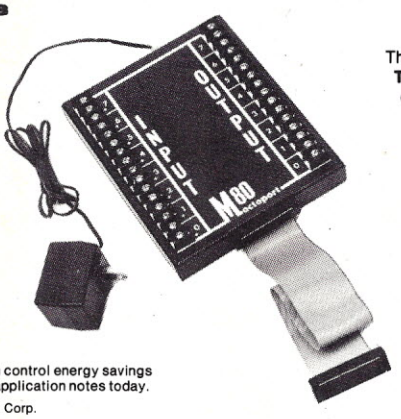
For higher power applications a 500W AC POWER MODULE is available for $15.

CB-1 CONTROLLER Kit $129.
Assm/tested $179.

MULLEN Computer Products

M-80 CONTROL BOX

TRS-80* accessory



The **M-80 OCTOPORT** is a simple to use interface for the **TRS-80 COMPUTER.** You can **control 8 external devices and sense 8 external conditions.** Each output uses a reed relay and each input an opto-isolator to electrically isolate your TRS-80.

One or more controllers can be connected to either the interface connector or the screen printer connector.

Each OCTOPORT is shipped completely assembled, tested and INCLUDES the interconnector cable, a UL approved power pack, and a 1 year warranty.

M-80 OCTOPORT CONTROLLER
$159. Assm/tested

Use your TRS-80, and our M-80 control box to program control energy savings devices at home or in your business. Send for our free application notes today.

*TRS-80 is a trademark of Tandy Radio Shack Corp.

H8 EXTENDER BOARD



Our HTB-0 lets H8 owners troubleshoot their boards faster and easier. Each board can be extended above the computer for complete access to all circuits and components.

FEATURES

- Sturdy 3/32" board
- Molex 25-pin edge connectors with formed leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy

HTB-0 H8 EXTENDER
$39. Kit

*H8 is a trademark of Heath Company.

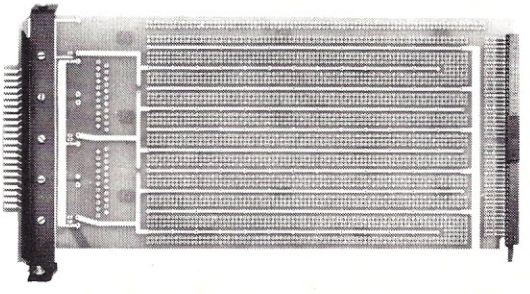
KLUGE BOARD DESIGNED WITH YOUR PROTOTYPING PROBLEMS IN MIND.

H8 PROTOTYPE BOARD

Now available for the Heathkit H8

- Full-sized FR-4 board with heat sink/mounting brackets, buss connectors and polarizing key
- Designed for ease of external cable connection
- All plated thru holes .042" on .1" centers, power and ground traces

HKB-1 H8 PROTOTYPE BOARD $30. Kit



PROTOTYPE KIT ACCESSORIES: if you wish to buy any of these accessories for your kit, please list parts and add price to total order. These parts may be ordered at any time, but an additional $1.50 shipping and handling will be charged. . . if ordered separately.

PRICES:	$ 5.00	(1) 44-pin edge/cable connector
	$ 2.00	(1) 5 Volt regulator with (2) 39uF capacitors
	$ 1.00	(1) 25-pin Molex connector (90° male)
	$ 1.00	(1) 25-pin Molex connector (female)

MULLEN COMPUTER PRODUCTS
BOX 6214, HAYWARD, CA 94544

OR PHONE (415) 783-2866 · VISA/MASTERCHARGE ACCEPTED.
INCLUDE $1.50 FOR SHIPPING & HANDLING.
CALIFORNIA RESIDENTS ADD TAX.

Order Direct or Contact your Local Computer Store.

✓ Reader Service—see page 226

Peripheral connections are quick and easy with these modifications.

Apple Connections

By Rolf A. Deininger and Don Tujaka

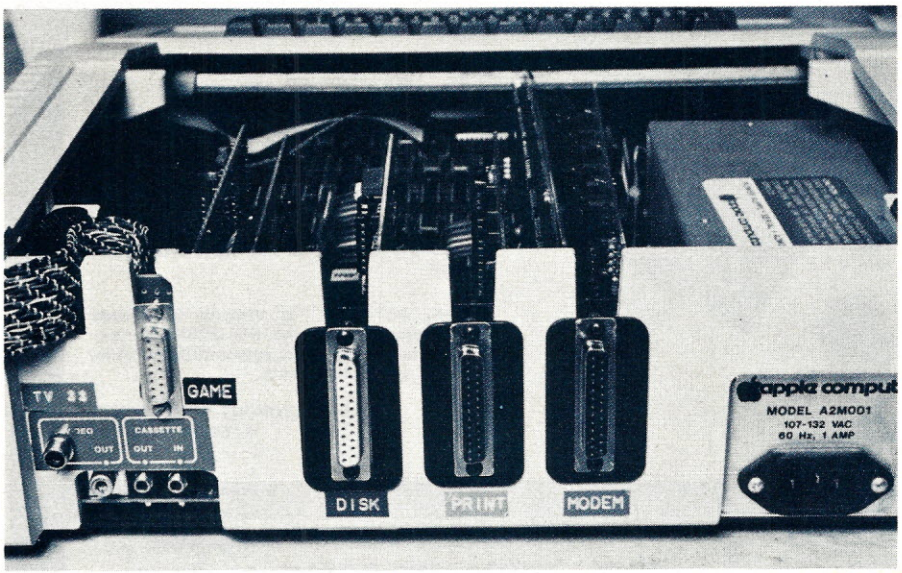


Photo 1. Rear of the Apple, as modified.

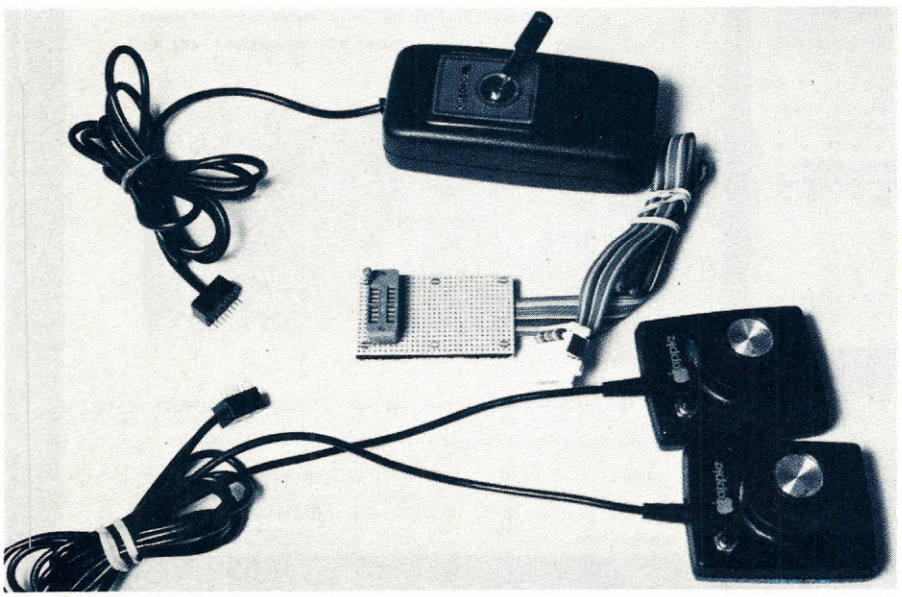


Photo 2. Connection cable for paddles and joysticks.

If you move an Apple frequently, you know that disconnecting and reconnecting the peripheral equipment is a nuisance. While printers and modems are neatly handled through the 25-pin DB connectors that come with the interface and communication cards, the disk, paddles and joysticks and rf modulator output are not as cooperative. You need to insert boards in slots, thereby flexing the motherboard, and handle DIP 16-pin connectors, which are difficult to insert and whose pins become bent when frequently used.

These modifications should solve some of your problems.

Disk connection—The disk and controller board are connected with a 20-lead ribbon cable, which is cut. A 25-pin female DB connector is soldered to the cable and inserted in a slot. The male 25-pin connector, a Winchester DB25, requires no soldering.

Game I/O—On the Apple motherboard's 16-pin IC socket, only 14 pins actually carry signals; pins 9 and 16 are not connected. To bring the signals to the outside, a 16-pin DIP connector and cable is connected to a 15-pin female DB with the pin numbers corresponding; pins 9 and 16 are not connected. A removable cable then takes the signals to a small plate with a 16-pin ZIP (zero insertion pressure) DIP socket, which allows an easy exchange of paddles and joysticks. Other devices, such as a remote control box, can be directly

Rolf A. Deininger and Don Tujaka, University of Michigan, School of Public Health, Ann Arbor, MI 48109.

connected to the 15-pin connector.

TV signal output—The video output signal at location J 14 B is put through a SUP'R'MOD rf modulator, routed twice through the toroids and then brought to the outside in the form of a standard RCA phonojack. This allows straight connection to a color TV (channel 33) with a shielded cable.

Photo 1 shows the Apple from the back as modified. From right to left, the boards are:

Slot 0: Applesoft card whose toggle switch was amputated (still functional, but does not interfere with slot in back).
Slot 1: Apple clock.
Slot 2: Communications interface.
Slot 4: Serial interface to printer.
Slot 6: Disk controller.
Slot 7: Analog/digital converter, whose 40-lead ribbon cable exits through the remaining slot.

Photo 2 shows the connection cable for paddles and joysticks, and Photo 3 shows the remote control box. With these modifications Apple connections are now simple and fast.■

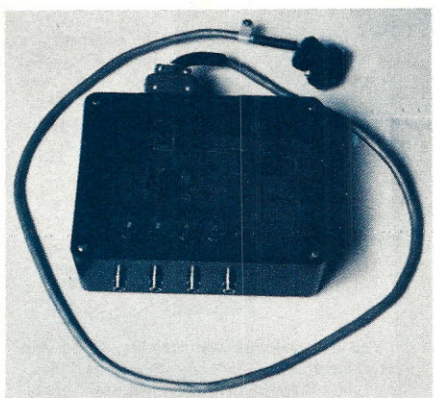


Photo 3. The remote control box.

Look to Aristo/Polks for reliability, quality, product versatility and value

IN NEW YORK CITY

OHIO SCIENTIFIC & ARISTO/POLKS FULL STOCK AND SERVICE ON CHALLENGER MICRO-COMPUTERS.

CHALLENGER C1P 8K	$399.00
C1P 5" FLOPPY 20K	$1250.00
SUPERBOARD C1P	$299.00
CHALLENGER (COLOR) C4P 8K	$750.00
C4P FLOPPY 24K 5"	$1795.00
CHALLENGER C8P	$950.00
COLOR-DUAL 8" FLOPPY C8P	$2895.00
C-3 48K DUAL FLOPPY 8"	$4095.00
C-3 + 23 MEG HARD DISK	$12,995 00
C-2-0EM 48K DUAL FLOPPY 8"	$2799.00

PLUS ALL SOFTWARE & PERIPHERALS

Mail order invited if machine can be sent back to us for service. 220V conversions available for systems-write for quote. Write for free catalog. *M/C, VISA, AX CARDS ACCEPTED.*

Aristo/Polks • 212-279-9034 ✓220
314 5TH AVE.(32 ST) N.Y.C., N.Y. 10001
9:30/6-DAILY ■ THURS TIL 9 ■ SUNDAY 11-5

Look to Aristo/Polks for reliability, quality, product versatility and value

ΩMEGA SALES CO. ✓89

"WHOLESALE COMPUTER PRICES" DIRECT TO THE PUBLIC
12 Meeting St., Cumberland, RI 02864

PRODUCT SPECIAL of the MONTH!!



Products are NOW IN STOCK AT ΩMEGA SALES CO.

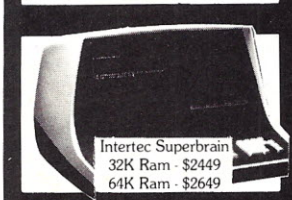
TeleVideo - 912B - $ 699
912C - $ 699
920C - $ 769


Apple II - 16K $ 949
48K $1099

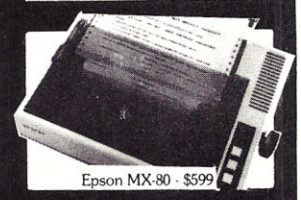

NEC spinwriter
5510-5530 - $2449


Atari 800 - $749

ΩMEGA OFFERS THE BEST DELIVERY AND PRICE ON:
APPLE • ATARI • TRS-80 Model II • INTERTEC •
DIABLO • EPSON • HEWLETT-PACKARD • SOROC •
COMMODORE • NEC • QUME • CENTRONICS


Intertec Superbrain
32K Ram - $2449
64K Ram - $2649


Diablo 630 - $2295
(with tractor feed)


Epson MX-80 - $599

ΩMEGA sells only quality merchandise to our customers.
ΩMEGA will try to match any current advertised price with similar purchase conditions. Before you buy anywhere else — be sure to call ΩMEGA Sales Co.
1-401-722-1027

CALL TOLL FREE FOR ΩMEGA'S PRICE!
1-800-556-7586

VISA

ΩMEGA ships via UPS, truck, or air. COD's.
Visa, Mastercharge accepted, with no service charge.

master charge

ΩMEGA "A member in good standing of the better business bureau."

✓Reader Service—see page 226

René Descates * Homer * Jeremy Bentham * Plato * John Adams * Pliny the Elder *

* Galileo Galilei * Sigmund Freud * Michelangelo * Ludwig Van Beethoven * Leibtniz * Thomas Hobbes *

Computer\n

1: Device designed to execute a sequence of mathematical operations.

Education for the Home



Beginner's Russian

This package consists of three programs that graphically display the Cyrillic alphabet. The programs are arranged so that you progress from one to the next—building your knowledge as *you* progress. It includes instructions on proper pronunciation of the letters and even an introduction to simple Russian words.
Order No. 0136R $9.95

Everyday Russian

Everyday Russian will acquaint you with the Russian words relating to: foods, places to eat, everyday signs, and the names of common stores. You will also learn the order of the Cyrillic alphabet. Each of the three divisions of this package will teach you the words and then quiz you on comprehension. You can even practice typing in Russian, using your TRS-80 keyboard as a "Cyrillic typewriter."
Order No. 0137R $9.95

The Russian Disk

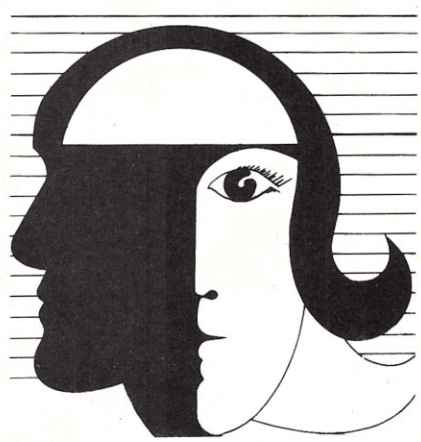
Now you can have *both* the Beginner's Russian and Everyday Russian packages on floppy disk! Requires an Expansion Interface with 16K and one disk drive.
Order No. 0212RD $24.95

Teacher

This program allows you to input any number of questions and answers. The computer will prepare tests, give quizes, provide up to three hints per question and even give (optional) graphic rewards for correct answers. Perfect for parents, teachers, or anyone faced with learning a lot of data in a short time.
Order No. 0065R $9.95

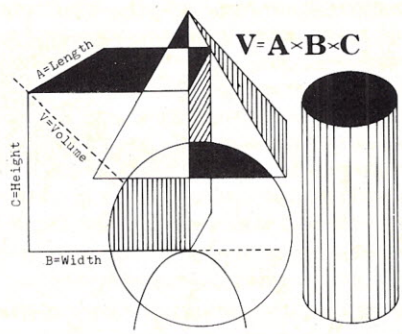
Wordwatch

Four programs for budding lexicographers, etymologists, or anyone else who uses words. In WORD RACE, you must choose the proper definitions. Find the misspelled word in HIDE N SPELL. Take a pre-recorded quiz in SPELLING BEE, in which the words are played aloud! Meet variations on proper spelling in SPELLING TUTOR.
Order No. 0111R $7.95



IQ Test

Are you smart enough to buy this package? IQ Test will administer and score an intelligence test in 30 minutes flat! There are three equivalent tests, each consisting of 35 questions, designed to test your general knowledge and problem solving abilities. Most of us claim a "touch of genius"—here's your chance to prove it!
Order No. 0157R $9.95



Archimedes' Apprentice

A tutorial software package that will teach you the formulas used to find the volume of *any* solid object. It covers parallelopipeds (cubes and rectangular solids), prisms, pyramids, cylinders, cones and spheres. It can even quiz you on how well you learned the lesson.
Order No. 0092R $9.95

Video Speed-Reading Trainer

You can increase your reading speed and comprehension. How? By practicing, that's how! This three-part program will flash characters or words on the screen, then you must echo what you saw. You can begin at a relatively slow rate, because the computer will advance your speed automatically as your speed and comprehension increase. It will train you with numbers, letters, words and phrases.
Order No. 0100R $9.95

Typing Teacher

A complete seven-part package that guides you from familiarization with the keyboard, through typing words (and phrases), to mastery of touch typing. Your video monitor becomes a bottomless page for typing practice!
Order No. 0099R $9.95

All packages listed are for the TRS-80 Model I Level II; they require 16K of memory and are cassette-based unless otherwise indicated.

Instant Software™

PETERBOROUGH, N.H. 03458
603-924-7296

Rebbe Akiva * John Stuart Mill * Pythagoras * Niccolo Machiavelli * Sun Tzu Wu *

William Shakespeare * Thomas Edison * Aristotle * William of Occam * Thomas Jefferson * Baruch Spinoza * Sri Ramakrishna * Thomas Gainsborough * Hippocrates * Blaise Pascal * Socrates * Voltaire * El Greco * Aeschylus * Oliver Wendell Holmes * Ptolemy

Education\n

1: The action or process of training and developing knowledge.

Education for the School

Basic Math Program from EMSI

The Basic Math Program is a comprehensive math teaching package. It was created by a certified math teacher with 15 years of programming experience.

The first three programs comprise: Whole Number Arithmetic by Teaching Objective. This set includes Addition, Subtraction and Multiplication. The fourth program is Fractions and Mixed Number Arithmetic. Logic and Deductive Reasoning is the fifth program in the set. The Metric/English Conversion program rounds out the series.

You choose from a MENU of options, so as to custom-tailor both practice and test sessions. The program options include: Number of Problems/Session, Level of Problem Difficulty, Number of Seconds/Problem, Type of Assistance to be Offered, and Type of Reward.

The package includes a 60 page teacher's manual that contains detailed instructions on how to use the programs. It shows you *exactly* what material will be on the monitor and how to select the program options. It further explains how to analyze the session results by number of problems correct, actual problems given, if an incorrect digit was entered, if it was corrected and whether the HELP feature was used.

Fractions and Mixed Number Arithmetic shows the student every step of how to solve the problems. It waits for the student to enter each answer and, if he makes an error, reviews the material so the error can be found.

Deductive Reasoning is a modified and much improved Mastermind-type exercise.

Metric/English Conversion will convert quantities (length, area, volume and weight) from Metric to English, or English to Metric.

Order No. 5002R $80.00

Grade Book

Teachers, now you can use the speed and accuracy of the TRS-80 to help you calculate student grades. Type in the scores for tests, quizzes, homework, classwork or special projects. The Grade Book program will calculate and display individual grade averages.

The program permits you to weigh student performance scores and convert raw score totals to a 100-points-equals-perfect-score basis. You can also average quarterly grades with the grades for the previous quarter, semester and final exam, to obtain an average grade for the year.

When grading time comes around, don't chain yourself to a calculator—go modern with the Grade Book package.

Order No. 0050R $9.95

Teacher's Aide

Now you can have the benefits of Computer Assisted Instruction (CAI) in your own home. The Teacher's Aide program will let you create a teaching system for any conceivable subject. The program allows you to create a question and answer lesson (you can input up to 8000 characters per lesson). You can then save this lesson on the disk and create an entire sequence of lessons.

Your lessons can be tailor-made for you or your students. The options available are: (1) review the material prior to taking the lesson, (2) provide hints to help answer questions, and (3) offer a graphic display as a reward for correctly answering all the questions. The Teacher's Aide program will even allow for spelling errors!

The Teacher's Aide package is perfect for parents, teachers, and students who need the unlimited patience and undivided attention only a computer can provide. Readin', writin', and 'rithmatic will never be the same—now that you have the Teacher's Aide package from Instant Software.

This package requires the following minimum system:

1. A TRS-80 Level II with 16K RAM.
2. An Expansion Interface with 16K RAM.
3. One disk drive.
4. Any compatible Disk Operating System.

Order No. 0214RD (disk-based) $39.95

call now

Toll-Free
1-800-258-5473
OR USE OUR ORDER FORM BELOW

We Guarantee It!

Instant Software Guarantee

OUR PROGRAMS ARE GUARANTEED TO BE QUALITY PRODUCTS. IF NOT COMPLETELY SATISFIED YOU MAY RETURN THE PROGRAM WITHIN 60 DAYS. A CREDIT OR REPLACEMENT WILL BE WILLINGLY GIVEN FOR ANY REASON.

Name _____

Address _____

City _____ State _____ Zip _____

☐ Check ☐ Money Order ☐ VISA ☐ AMEX ☐ Master Charge

Card No. _____ Exp. Date _____

Signed _____ Date _____

Order your Instant Software today!

Quantity	Order No.	Program name	Unit cost	Total cost
		Shipping and handling		$1.00
			Total order	

Instant Software™ Inc.
Peterborough, N.H. 03458

✓40

Man your rocket ship for a journey into the fast-moving world of Apple II color graphics.

Space Race

By Robert M. Hirbernik

Try your hand at piloting a spaceship through an asteroid belt with Space Race, an exciting, fast-moving color graphics game for any Apple II computer with as little as 8K of memory.

The object is to pilot your rocket to the top of the screen as many times as you can in 90 seconds, while trying to avoid a stream of oncoming asteroids. You can play alone, or with an opponent. The program provides instructions on the screen, if desired. You need only select a single-letter response, Y or N. You also have a choice of several skill levels. The amateur level is well suited for children, or for adults playing the game for the first time. Most people will find the intermediate level comfortable, while the professional level is exceptionally challenging, even for the experienced player.

The game is played with hand controllers. Paddles zero and one control the left and right spaceships, respectively. If you rotate a paddle counterclockwise, the ship rises; if it is rotated clockwise, the ship descends. If you turn the paddle toward the middle, the ship will remain still.

```
PLOT    EQU $F800       lores plot in ROM
SETCOL  EQU $F864       lores color set
BLUE    EPZ $02         lores blue
WHITE   EPZ $0F         lores white
SPKR    EQU $C030       speaker address
        ORG $0300
        OBJ $0800
MOVE    LDA #BLUE       background color
        JSR PLOTSC      remove old asteroids
        LDX #$2F        number of asteroids (must be odd)
NEXT    DEC TABLEX,X    move left
        BPL CONT        past left side of screen?
        LDA #$27        yes, put on right side
        STA TABLEX,X    and save in table
CONT    DEX             no, get next asteroid
        INC TABLEX,X    move right
        LDA #$28        off-screen marker
        CMP TABLEX,X    past right side of screen?
        BNE CONT1       no, continue
        LDA #$00        yes, put on left side
        STA TABLEX,X    and save in table
CONT1   DEX             done with all asteroids?
        BPL NEXT        no, try again
        LDA #WHITE      yes, plot new asteroids
PLOTSC  JSR SETCOL      set to color in accumulator
        LDX #$2F        number of asteroids (must be odd)
NEXT1   LDA TABLEX,X    get X coordinate
        TAY             and save in index Y
        LDA TABLEY,X    get Y coordinate
        JSR PLOT        jump to plot routine in ROM
        DEX             done with all asteroids?
        BPL NEXT1       no, try again
        RTS             yes, back to BASIC
SOUND   LDX #$00        clear index X
SOUND1  LDA SPKR        toggle speaker
        TXA             put X into A
        TAY             transfer to Y for delay
WAIT    DEY             done?
        BNE WAIT        no, try again
        DEX             finished with sound?
        BNE SOUND1      no, continue
        RTS             yes, return
TABLEX  EQU *           start of table (X)
TABLEY  EQU *+$30       start of table (Y)
        END
```

Listing 1. The asteroid mover routine in machine language. It was assembled using Lazer System's LISA.

Program Description

Space Race would be no fun if the asteroids didn't move simultaneously. To do this I needed speed, and Apple BASIC, fast as it is, wasn't going to cut it. So I wrote a machine-language routine to move the asteroids around, and left the main program in BASIC.

I came across two useful routines in the Apple reference manual. PLOT, located at $F800, was the easiest to find, since it was at the starting address of the monitor. Nearby was the color-setting routine, located at $F864.

For my asteroid mover, I set up buffers for the X and Y coordinates of the asteroids, and later plotted them at these coordinates. In Listing 1, you'll see that the asteroids are first erased from the screen. The ones in odd-numbered positions in the coordinate buffers are moved to the left, and those in even-numbered positions are moved to the right.

Also in Listing 1 is a tone generator, which indicates if a rocket has been wiped out by an asteroid. I put these

Robert M. Hirbernik, 46 Cornell Circle, Pueblo, CO 81005.

routines in the third page of memory so they would be out of the way of the BASIC program.

The actual game is located from line 120 to line 440 in the BASIC program (Listing 2).

In lines 120 through 180, the two ships are displayed on the screen, depending on the values of HLD1 and HLD2. These two variables are penalty timers that prevent the ships from taking off immediately after crashing. The asteroids are moved one position across the screen. If a ship and an asteroid collide, the ship will be erased from the screen and placed back at the bottom. The appropriate penalty timer (HLD1 or HLD2) will be set to 15, which is equal to a 1.5-second delay. A machine-language routine now produces the crash sound.

In lines 190 through 280, if a ship has reached the top of the screen, the score is incremented by one and the ship is put back at the bottom. The clock is now decremented by one. The scores and the time remaining are then displayed, formatted to two digits. If there is no time remaining, the ships will be placed back on the launchpad, and the players will be given time to read their scores before the game starts over.

Lines 290 through 320 read the paddles to determine the new direction of the rockets: 1 is down, 0 is stationary and −1 is up.

If a penalty for crashing is still in effect, the new direction will be zero, and the penalty timers will be decremented by one. If necessary, the ships are removed from the screen and moved to their new positions. The loop then starts over with line 120.

Fig. 1 is the flowchart for Space Race and should clear up any questions you might have about the program.

Modifications

Some interesting modifications for Space Race are possible. You might try constructing control boxes with push buttons to make the ships go up and down. More industrious types might try rewriting the entire program in machine language to make use of Apple's high-resolution graphics. ■

Listing 2. The main program written in Apple's integer BASIC.

```
  100 GOSUB 20000
  110 GOSUB 25000: GOSUB 10000
  120 IF NOT HLD1 THEN GOSUB 370: IF NOT HLD2 THEN GOSUB 400
  130 CALL 768
  140 GOSUB 430
  150 IF TS1 OR HLD1 THEN 170
  160 GOSUB 380: Y1=37: HLD1=15: CALL 825
  170 IF TS2 OR HLD2 THEN 190
  180 GOSUB 410: Y2=37: HLD2=15: CALL 825
  190 IF Y1 THEN 210
  200 S1=S1+1: GOSUB 380: Y1=37
  210 IF Y2 THEN 230
  220 S2=S2+1: GOSUB 410: Y2=37
  230 CLK=CLK-1
  240 VTAB 21: TAB 8-(S1>9): PRINT S1;: TAB 20: IF CLK<100 THEN
      PRINT "0";: PRINT CLK/10;: TAB 33-(S2>9): PRINT S2;
  250 IF CLK/10 THEN 290
  260 GOSUB 380: GOSUB 410: Y1=37: Y2=37: GOSUB 370: GOSUB 400
  270 FOR K=1 TO 40: CALL 768
  280 FOR K1=1 TO 50: NEXT K1,K: GOTO 110
  290 D1=(PDL(0)/85-1) * NOT HLD1: IF HLD1 THEN HLD1=HLD1-1
  300 D2=(PDL(1)/85-1) * NOT HLD2: IF HLD2 THEN HLD2=HLD2-1
  310 T1=Y1: T2=Y2: T1=T1+D1: IF T1>37 THEN T1=37: T2=T2+D2: IF T2>37
      THEN T2=37
  320 IF Y1#T1 THEN GOSUB 380: IF Y2#T2 THEN GOSUB 410: Y1=T1:
      Y2=T2: GOTO 120
  370 COLOR=13: GOTO 390
  380 COLOR=2
  390 PLOT 7,Y1: VLIN Y1+1,Y1+2 AT 6: VLIN Y1+1,Y1+2 AT 8: RETURN
  400 COLOR=13: GOTO 420
  410 COLOR=2
  420 PLOT 32,Y2: VLIN Y2+1,Y2+2 AT 31: VLIN Y2+1,Y2+2 AT 33: RETURN
  430 TS1=(SCRN(7,Y1)=13) AND (SCRN(6,Y1+1)=13) AND (SCRN(8,Y1+1)=13)
      AND (SCRN(6,Y1+2)=13) AND (SCRN(8,Y1+2)=13)
  440 TS2=(SCRN(32,Y2)=13) AND (SCRN(31,Y2+1)=13) AND (SCRN(33,Y2+1)=13)
      AND (SCRN(31,Y2+2)=13) AND (SCRN(33,Y2+2)=13): RETURN
10000 TEXT: CALL -936: VTAB 7: TAB 16
10010 PRINT "SPACE RACE": TAB 16: PRINT "----- ----"
10020 VTAB 18: TAB 12: PRINT "INSTRUCTIONS? (Y/N)"
10030 POKE -16368,0
10040 IF PEEK(-16384)=206 THEN 10060
10050 IF PEEK(-16384)=217 THEN 10220: GOTO 10040
10060 CALL -936: VTAB 3: TAB 7
10070 PRINT "WHAT IS YOUR SKILL LEVEL?": VTAB 8: TAB 12
10080 PRINT "A)  AMATEUR": VTAB 12: TAB 12
10090 PRINT "B)  INTERMEDIATE": VTAB 16: TAB 12
10100 PRINT "C) PROFESSIONAL": POKE -16368,0: SK=0
```

More

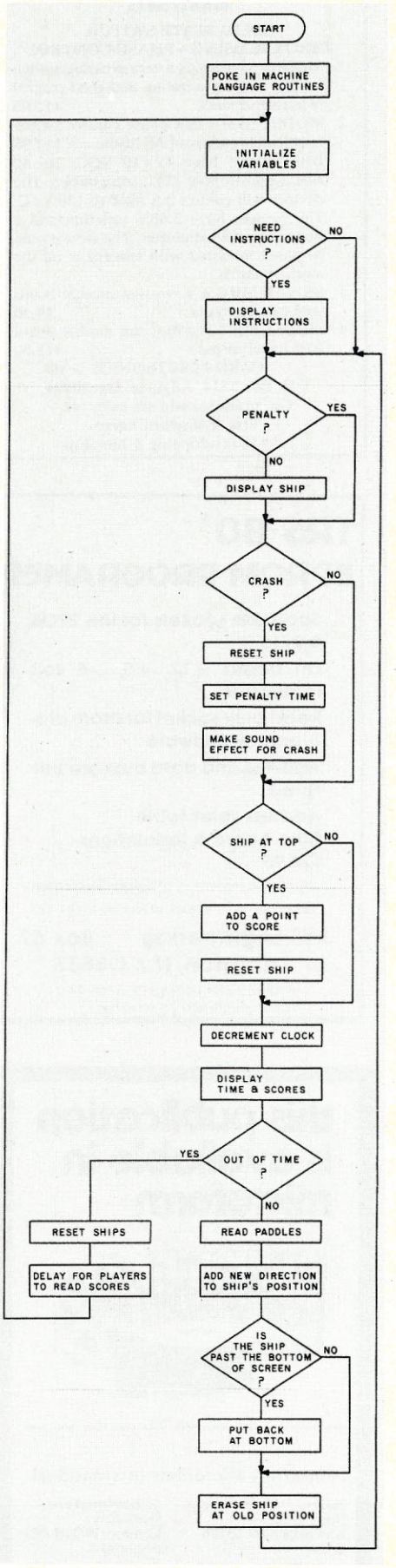
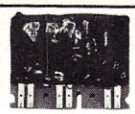


Fig. 1. Flowchart for Space Race.



SOLID STATE SWITCH
ZERO CROSSING—PHASE CONTROL

1. MODEL SS-4/A-Z is a zero crossing switch for low noise generation and good control of inductive loads. $12.95
2. MODEL SS-4/A is a phase control switch for variable control of AC loads. $12.95
Both models have 4V-10 VDC, 10-40 MA. Control input (TTL compatible). The devices will control 2.5 AMP @ 120 VAC. The devices have 3.5KV isolation and a varistor protected output. The devices can be panel mounted with spacers or on the motherboards.
3. MODEL MB-2 is a two slot mother board with fused outputs. $9.50
4. MODEL MB-4 is a four slot mother board with fused outputs. $18.50

CARD ELECTRONICS ↙197
P.O. Box 3514, Augusta, Ga. 30904
Ga. residents add 4% sales tax
Visa & Master Charge
Add $2.00 shipping & handling

TRS-80*
EPROM PROGRAMER

Separate sockets for the 2708 & 2716
On board +12, +5, −5 volt regulators
Read only socket for prom programmer software
Address and data buss are buffered
Address selectable
Bare board & instructions-
$24.95

*TRS-80 is a trademark of Tandy Corporation.

-to order-Send Check or Money Order to:

JWS Engineering Box 67
↙203 **Lebanon, N.J. 08833**
Add $2.50 for postage and handling
N.J. residents add 5% sales tax

Listing 1 continued.

```
10110 IF PEEK(-16384)=193 THEN SK=15
10120 IF PEEK(-16384)=194 THEN SK=31
10130 IF PEEK(-16384)=195 THEN SK=47
10140 IF SK=0 THEN 10110: POKE 774,SK: POKE 810,SK
10150 FOR M=0 TO SK: POKE M+839, RND(40)
10160 POKE M+887,RND(19)*2: NEXT M
10170 GR: COLOR=2: FOR M=0 TO 39
10180 VLIN 0,39 AT M: NEXT M
10190 VTAB 21: TAB 7: PRINT "0";: TAB 32: PRINT "0";
10200 VTAB 23: TAB 16: POKE 50,63: PRINT "SPACE RACE"
10210 TAB 16: PRINT "----- ----";: POKE 50,255: RETURN
10220 CALL -936: VTAB 2: TAB 16: POKE 50,63: PRINT "SPACE RACE":
      POKE 50,255
10230 VTAB 4: PRINT "THE OBJECT OF THIS GAME IS TO PILOT YOUR": PRINT
      "SHIP THROUGH AN ASTEROID BELT MORE TIMES"
10240 PRINT "THAN YOUR OPPONENT WITHIN 90 SECONDS.   ": PRINT
10250 PRINT "THE SHIPS ARE CONTROLLED BY USE OF THE  ": PRINT "PADDLES.
      THE CENTER POSITION WILL KEEP  "
10260 PRINT "THE SHIP STILL. ROTATING THE PADDLE LEFT": PRINT "OR
      RIGHT WILL MOVE THE SHIP UP AND DOWN."
10270 VTAB 23: PRINT "PRESS 'RETURN' WHEN READY.": POKE -16368,0
10280 IF PEEK(-16384)<128 THEN 10280: GOTO 10060
20000 REM  STAR MOVER
20010 POKE 768,169: POKE 769,2: POKE 770,32: POKE 771,38
20020 POKE 772,3: POKE 773,162: POKE 774,47: POKE 775,222
20030 POKE 776,71: POKE 777,3: POKE 778,16: POKE 779,5
20040 POKE 780,169: POKE 781,39: POKE 782,157: POKE 783,71
20050 POKE 784,3: POKE 785,202: POKE 786,254: POKE 787,71
20060 POKE 788,3: POKE 789,169: POKE 790,40: POKE 791,221
20070 POKE 792,71: POKE 793,3: POKE 794,208: POKE 795,5
20080 POKE 796,169: POKE 797,0: POKE 798,157: POKE 799,71
20090 POKE 800,3: POKE 801,202: POKE 802,16: POKE 803,227
20100 POKE 804,169: POKE 805,15: POKE 806,32: POKE 807,100
20110 POKE 808,248: POKE 809,162: POKE 810,47: POKE 811,189
20120 POKE 812,71: POKE 813,3: POKE 814,168: POKE 815,189
20130 POKE 816,119: POKE 817,3: POKE 818,32: POKE 819,0
20140 POKE 820,248: POKE 821,202: POKE 822,16: POKE 823,243
20150 POKE 824,96
20160 REM  SOUND FOR CRASH
20170 POKE 825,162: POKE 826,0: POKE 827,173: POKE 828,48
20180 POKE 829,192: POKE 830,138: POKE 831,168: POKE 832,136
20190 POKE 833,208: POKE 834,253: POKE 835,202: POKE 836,208
20200 POKE 837,245: POKE 838,96
20210 RETURN
25000 Y1=Y2=HLD1=HLD2=CLK=S1=S2=T1=T2
25010 Y1=37: Y2=37: HLD1=0: HLD2=0: CLK=900: S1=0: S2=0
25020 RETURN
30000 REM
30010 REM **********************
30020 REM *    SPACE RACE     *
30030 REM **********************
30040 REM *                    *
30050 REM * R. M.  HIRBERNIK *
30060 REM *                    *
30070 REM *  MARCH 27, 1980   *
30080 REM *                    *
30090 REM **********************
32767 END
```

this publication is available in microform



University Microfilms International

300 North Zeeb Road
Dept. P.R.
Ann Arbor, MI 48106
U.S.A.

18 Bedford Row
Dept. P.R.
London, WC1R 4EJ
England

HIGH SPEED
16K MEMORY
$38.00

Set of 8 4116 RAM chips, for use in Apple, Heath, Pet or TRS-80. Add $3.00 for shipping & handling (CA residents add 6% sales tax).

Visa, Mastercharge orders **800-538-8559** (outside CA).

exatron ↙57
181 Commercial Street
Sunnyvale, CA 94086

408-737-7111

ENTERTAINING, EXCITING & EDUCATIONAL
APPLE II
SOFTWARE

MATH CHALLENGER—Teaches and tests the basic arithmetic skills to children of 4-12 years. Has four skill levels using graphics and sounds. 8K RAM IA $5.95

SEA BATTLE is played much like the popular game of Battleship. You are pitted against the Apple II in this game of hit and miss. Uses dazzling graphics and exciting sounds. 12K RAM IA $12.95

HANGMAN—Outwit the computer by guessing a word which the computer selects from an enormous bank of 1160 words. Three skill levels with words ranging from 3-10 letters in length. Colorful graphics with sounds make HANGMAN fun as well as challenging. 16K RAM IA $12.95

MARS LANDER—Maneuver the spacecraft to a successful landing on Mars' surface. Uses HI-RES graphics and exciting sounds for a realistic adventure of the future. 24K RAM A $12.95

I—Integer BASIC A—Applesoft BASIC

FIREFLYER COMPUTING
2075 N. Stadium Lane
Provo, Utah 84601
(801) 375-2377 ↙131

Apple II and Applesoft are trademarks of Apple Computers Inc.

FOR OSI COMPUTERS

★ SMARTERM ★

An 'Intelligent' Terminal Software System for OSI Computers by Phil Lindquist

- Even, Odd, or No Parity Use-Selected
- Full or Half Duplex Operation
- User Controlled Storage of Incoming Data
- Stored Data Printed or Saved on Disk
- Saved Data Recalled For Review or Output
- Control Key Initiation of LOGON Messages

- Join The Micro Communications Revolution -

C2-4P MF, C4P MF Systems $19.95
C2-8P DF, C8P DF, C4P DF Systems $23.95

Order From:

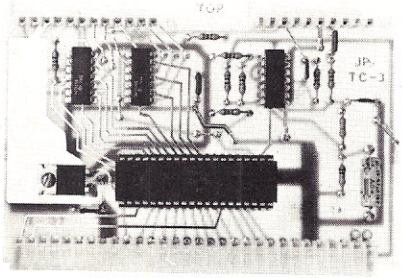
COMPUTER CONNECTION, INC.
38437 Grand River • Farmington Hills, Mich. 48018

✓278

Dealer Inquiries Welcome

JPC PRODUCTS FOR

6800 COMPUTERS



High Performance Cassette Interface

- **FAST** - 4800 Baud Loads 4K in 8 Seconds!
- **RELIABLE** - Error Rate Less Than 1 in 10^6 Bytes.
- **CONVENIENT** - Plugs Directly Into The **SWTPC.**
- **PLUS** - A Fully Buffered 8 Bit Output Port Provided.
- **LOW COST** - $59.95 For Complete Kit.

- **OPTIONAL** - CFM/3 File Manager.
  Manual & Listing $19.95
  (For Cassette Add) $ 6.95

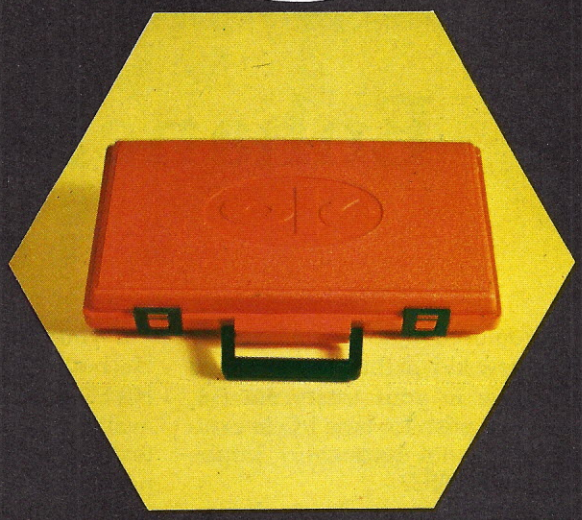
TERMS: CASH, MC or VISA; Shipping & Handling $3.00

JPC products

✓92

Order Phone (505) 294-4623
P.O. Box 5615
Albuquerque, N.M. 87185

ok®





Wire Wrapping Kit

Model WK-5 is a unique new Wire Wrapping Kit that contains a complete range of tools and parts for prototype and hobby applications, all conveniently packaged in a handy, durable plastic carrying case.

The kit includes Model BW-630 battery wire wrapping tool complete with bit and sleeve; Model WSU-30, a remarkable new hand wire-wrapping/unwrapping/stripping tool; a universal PC board; an edge connector with wire-wrapping terminals, a set of PC card guides and brackets; a mini-shear with safety clip; industrial quality 14, 16, 24 and 40 pin DIP sockets; an assortment of wire-wrapping terminals; a DIP inserter; a DIP extractor and a unique 3-color wire dispenser complete with 50 feet each of red, white and blue Kynar® insulated, silver plated solid AWG 30 copper wire.

OK Machine & Tool Corporation
3455 Conner St., Bronx, N.Y. 10475 U.S.A.
Tel. (212) 994-6600 Telex 125091

✓276

®Pennwalt

✓Reader Service—see page 226

Faced with a desire for additional capability from BASIC, the author took a closer look at H8 user subroutines and discovered how simple the interface between them and BASIC can be.

Enhancing H8 BASIC

By Edgar C. Howell

Are you tired of being upstaged by the new kid on the block? Do you still believe in your trusty old H8, even as you wish for tape I/O or exotic functions not reasonably implemented in BASIC?

If you initially reacted to the limitations of Heath's BASIC as I did, don't wait as long to discover how easily they can be overcome.

After reading that only one argument can be passed to a user subroutine, I gave up on the idea of writing subroutines. And the lack of tape record I/O instructions precluded routines to manipulate files, such as balancing my checkbook. So, having bought and built the hardware to play with the assembler anyhow, I mentally relegated this BASIC to the realm of games.

Then one day came the need for terminal input, saving the file, sorting and totals. This was too grim to consider exclusively in assembler, so I took a closer look at BASIC.

I found that although the H8 BASIC user subroutine call formally restricts you to a single argument and a single return value, these can be memory addresses, and you can peek and poke additional values as well.

If you are using Extended Benton Harbor BASIC version 10.01.01 on an H8/H9 with 16K, these routines will enable you to read files created by the text editor. You could use additional panel monitor calls to write them as well, but once you see how easy the interface is, you might consider doing something really useful.

Be careful if your environment is different. Note *what* is done; *how* it is done may not be applicable to your system. For example, if you have 32K and follow the directions below, you will waste half your memory. Step 2 of Table 1 overrides the configured high memory to reserve for user subroutines the last 1K of a 16K system—or 17K of a 32K system!

Loading BASIC and a Subroutine

Table 1 shows one way to combine BASIC and a user subroutine in memory. In version 10.01.01 a cold start jumps to 041.156 (offset octal as usual) to initialize the stack pointer. The value to be changed (137.377) is the operand of a three-byte instruction, the high memory address entered when you initially configured BASIC.

In this case, subtracting 4 from the high-order byte reduces the initial value of the stack and reserves 1024 bytes of memory above it. Since loading changes the contents of the program counter, step 4 merely ensures that it points to the entry point of BASIC.

While this procedure proved adequate in testing the user subroutine discussed below, as always it would be a better idea to follow Heath's directions to configure a copy of BASIC once you know how much memory to reserve for your subroutine. If you do this, step 2 becomes unnecessary. As step 5 implies, this procedure should be done before executing BASIC; if done afterwards, the FREE function will not correctly reflect the new high memory limit. That may have any number of other consequences.

The BASIC Program

Listing 1 is a BASIC program that prints TED-8 records given to it by a user subroutine. Lines 100–110 tell BASIC where to begin executing the subroutine when called in line 210. This address could have been set as part of the procedure in Table 1, but dynamically poking the address allows you to select one of several user subroutines.

If you have two tape drives, you might want two subroutines—one for input, one for output. Then each time you want to swap from input to output or vice versa, you would only need to poke the corresponding subroutine address before calling USR.

Lines 120–130 ensure that the subroutine always reads a block from tape when you run the program. Otherwise, if the program is interrupted by CTRL-C, the subroutine will not necessarily read but will continue with the next line in the input buffer when you run again.

```
100 POKE 17267,0          :REM GIVE BASIC ADDRESS
110 POKE 17268,92         :REM   OF USER SUBROUTINE
120 POKE 23628,0          :REM ZERO ADDR LAST BYTE READ TO
130 POKE 23629,0          :REM   FORCE INITIAL READ IF RE-RUN
200 FOR I = 1 TO 1000     :REM LOTS OF TIMES
210 K = USR(0)            :REM ADDRESS NEXT LINE FROM TAPE
220 L = PEEK(K)           :REM NEXT CHARACTER THIS LINE
230 K = K + 1             :REM BUMP CHARACTER POINTER
240 IF L < 128 THEN 260 :REM JUMP IF NOT COMPRESSED BLANKS
250 FOR M = 129 TO L:PRINT " ";:NEXT M:GOTO 220
260 IF L > 0 THEN PRINT CHR$(L);:GOTO 220
270 PRINT                 :REM END OF LINE
280 NEXT I
999 END
```

Listing 1. Printing text input by user subroutine.

Edgar C. Howell, 2909 Tapo St., Simi, CA 93063

1. Load BASIC
2. Change the address of 041.157 to the desired high-memory address; e.g., to reserve 1K in a 16K system
   change 041.157 377
   041.160 137
   to 041.157 377
   041.160 133
3. Load assembled user subroutine(s)
4. Set PC to 040.100
5. Depress GO

Table 1. Appending user subroutines to H-8 BASIC.

This also demonstrates a simple way around the restriction to a single argument or return value, since the zero poked is essentially an additional argument telling the subroutine to ignore the current contents of its input buffer and read another block from tape. POKE can be used to perform initialization prior to the first call as well as to pass multiple arguments prior to each call, and PEEK will retrieve multiple return values.

In line 210 a user subroutine or USR call obtains the address of a line of text in the input buffer. Note that this is an address and not a character string. The loop from 220 to 260 prints the line, expanding compressed blanks, until a null is found signifying the end of the line. A similar loop could have been used to construct a character string by concatenating instead of printing.

The Assembler Subroutine

The assembler routine in Listing 2 communicates with the tape drive via PAM-8 subroutines, which are quite well documented, as usual, and available at no extra charge in ROM. The routine is ORGed to the first memory location above the stack, the same address poked in Listing 1, lines 100–110.

Use of Memory

The routine uses otherwise unused memory to hold a couple of addresses and store the data as it is input from tape. MADDR is a label for the address of the first available byte. The first two bytes there hold the address of the memory location in which the last byte read from tape is stored.

Since each line of text is terminated by a null, after the first line the routine merely looks for successive nulls and gives BASIC the address of the following byte—unless it would go beyond this last byte read, in which

```
* ADDRESSES OF PAM-8 ROUTINES
*
SRS     EQU  002265A    SCAN RECORD START
RNB     EQU  002331A    READ NEXT BYTE
TFT     EQU  002133A    TURN OFF TAPE
*
        ORG  23552
        PUSH PSW
        PUSH H
        PUSH D
        PUSH B
*
        LHLD MADDR+2    ADDR LAST LINE RETURNED TO BASIC
LOOP1   EQU  *
        INX  H          LOOK
        MOV  A,M          FOR
        ORA  A              END OF
        JNZ  LOOP1            LINE
*
        INX  H          ADDR 1ST BYTE NEXT LINE
        LDA  MADDR      GIVE BASIC
        SUB  L            THIS ADDRESS
        LDA  MADDR+1        IF NOT BEYOND
        SBB  H                LAST BYTE IN
        JNC  XINPT              INPUT BUFFER
*
        CALL SRS        SCAN RECORD START
        MOV  B,H        DATA
        MOV  C,A          COUNT
*
        LXI  H,MADDR+4-1  ADDR INPUT BUFFER - 1
*
NXTIN   EQU  *
        CALL RNB        READ NEXT BYTE
        INX  H          INTO
        MOV  M,A          BUFFER
*
        DCX  B          DECREMENT
        MOV  A,B          AND TEST
        ORA  C              DATA COUNT
        JNZ  NXTIN
*
        CALL TFT        TURN OFF TAPE
*
        SHLD MADDR      KEEP ADDR LAST BYTE READ
        INX  H          ENSURE TEST FOR
        MVI  M,0          END OF LINE WORKS
*
        LXI  H,MADDR+4  ADDR 1ST LINE IN BUFFER
XINPT   EQU  *
        SHLD MADDR+2    KEEP ADDR LINE BEING RETURNED
*
        POP  B          ADDR
        MOV  D,B          RETURN
        MOV  E,C            PARAMETER
*
        XCHG            ADDRESSABLE BY M
        MVI  M,0        GIVE
        INX  H            BASIC
        MOV  M,E            ADDR
        INX  H                NEXT
        MOV  M,D                LINE
        INX  H                    IN
        MVI  M,217A                 BUFFER
*
        POP  D
        POP  H
        POP  PSW
*
        RET
*
MADDR   EQU  *          AVAILABLE MEMORY
        DW   0          ADDR LAST BYTE READ
        DW   0          ADDR LAST LINE RETURNED TO BASIC
        END  0
```

Listing 2. User subroutine to input text for BASIC.

```
100 GOSUB 1000          :REM INITIALIZE NUMERIC KEYPAD
200 FOR I = 1 TO 10     :REM GET AND PRINT 10 "DIGITS"
210 J = USR(0)          :REM NEXT KEYSTROKE INTO MEMORY
220 K = PEEK(8214)      :REM FETCH IT
230 PRINT K;            :REM SHOW AND TELL TIME
240 NEXT I
250 STOP
1000 POKE 17267,0       :REM GIVE BASIC ADDRESS
1010 POKE 17268,92      :REM   OF USER SUBROUTINE
1100 FOR I = 23552 TO 23558
1110 READ J             :REM POKE MACHINE LANGUAGE ROUTINE
1120 POKE I,J           :REM   315 260 003   CALL  RCK
1130 NEXT I             :REM   062 026 040   STA   RCKA
1140 RETURN             :REM   311           RET
1200 DATA 205,176,3,50,22,32,201
```

Listing 3. Poking a user subroutine to input from the front panel keypad.

case another block of data is read.

The next two bytes (at MADDR+2) hold the address of the line previously passed to BASIC. Scanning for the next null always begins at the location whose address is stored here. And the remainder of the available memory (at MADDR+4) is used as an input buffer.

By the way, the routine is meant only to demonstrate user subroutines and is not complete, since it omits such functions as error processing, test for end of file and return codes. It can't even tell if it has a TED-8 file, and will happily read BASIC text.

Parameter Passing

Parameter passing is a bit sticky if your mind, like mine, doesn't function too well in floating-point binary. Upon passing control to the subroutine, BASIC leaves in register pair BC the address of a four-byte area used to pass a value to the subroutine or back to BASIC. Suffice it to say that 217_8 is an exponent adequate to tell BASIC that the value returned in the other three bytes contains 16 bits (including a sign-bit) to the left of the implicit binary point, i.e., can hold a high-memory address less than 32K. For details see p. 5–101 in the *Software Reference Manual*.

A Numeric Keypad for the H-8?

In conclusion, for anyone still not convinced that user subroutines can be easy, I submit in Listing 3 a routine with which you can quickly check it out and which you should be able to decipher—with a little help from our friends at Heath. While it will never replace the PAD function, execution of the subroutine at 1000 prepares BASIC to input from the front panel's numeric keypad. But watch out for that automatic repeat!

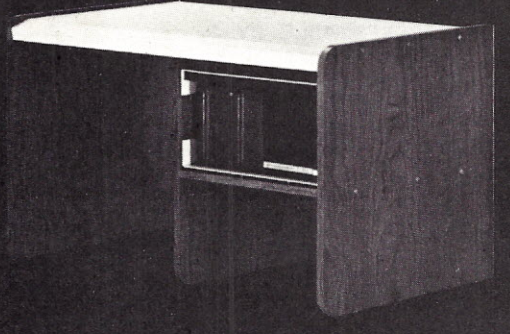
So there you have it—not at all as difficult as you might have anticipated. Just make BASIC reserve a little high memory for you, assemble the user subroutine at or above that address, load the assembled routine along with BASIC and make sure BASIC knows where to begin executing it.■

Desk Main/Frame

Desk Main/Frame

LOW COST & ATTRACTIVE STYLING

- MAIN/FRAME INTEGRATED INTO FURNITURE QUALITY DESK
- ELECTRONICS PACKAGE SLIDE MOUNTED FOR EASY ACCESS
- SUPPORTS TWO 8" FLOPPY DRIVES FROM SEVERAL MANUFACTURERS (DRIVES NOT INCLUDED)
- 10 SLOT MOTHERBOARD INCLUDES CONNECTORS
- POWER SUPPLY FOR DRIVES AND CARDS
- DESK AND MAIN/FRAME AVAILABLE SEPARATELY
- MATCHING PRINTER DESK AVAILABLE



WRITE OR CALL FOR OUR BROCHURE WHICH INCLUDES OUR APPLICATION NOTE: 'BUILDING CHEAP COMPUTERS'

INTEGRAND ✓77

8474 Ave. 296 • Visalia, CA 93277 • (209) 733-9288

We accept BankAmericard/Visa and MasterCharge

MICROPROCESSOR SUPPORT I.C.'S

WE GUARANTEE FACTORY PRIME PARTS

2708	1KX8	EPROM	3 Supply	450 ns	$5.50
2716	2KX8	EPROM	3 Supply	450 ns	$11.00
2716	2KX8	EPROM	1 Supply	450 ns	$11.00
2732	4KX8	EPROM	1 Supply	450 ns	$35.00
4116	16KX1	DYNAMIC	3 Supply	200 ns	8/$36.00
					32/$136.00
4116	16KX1	DYNAMIC	3 Supply	300 ns	8/$32.00
					32/$120.00
4164	64KX1	DYNAMIC	1 Supply	250 ns	$130.00
4118	1KX8	STATIC	250 ns	EXTRA	SPECIAL
					$16.00
2114	1KX4	STATIC	250 ns	$4.25	8/$32.00
2114L	1KX4	STATIC	250 ns	$4.50	8/$34.00

3242	$11.00	8224	$ 2.95	8255	$ 6.50
8155	17.50	8226	3.95	8259	17.95
8185	29.95	8228	5.50	8275	32.95
8202	45.00	8238	5.50	8279	13.95
8205	3.95	8243	6.00	8282	6.70
8212	2.75	8250	15.95	8283	6.70
8214	5.25	8251	6.95	8284	5.85
8216	2.75	8253	12.95	8755	49.95

TO ORDER: Send check, money order or charge card C.O.D. Please include $3.00 shipping. For C.O.D. allow for shipping and $2.00 C.O.D. fee.

HANLEY ENGINEERING

P.O.BOX 21432 ✓5

SEATTLE, WA 98111

(206) 633-3404

Send for full catalog including 74XX, 74LSXX and CMOS I.C.'s.

NEW! TPM* for TRS-80 Model II
NEW! System/6 Package
Computer Design Labs

Z80* Disk Software

We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.

— Carl Galletti and Roger Amidon, owners.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M* or similar type disk operating system (such as our own TPM*).

for TRS-80* CP/M (Model I or II)
for 8" CP/M (soft sectored single density)
for 5¼" CP/M (soft sectored single density)
for 5¼" North Star CP/M (single density)
for 5¼" North Star CP/M (double density)

BASIC I

A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. $49.95/$15.

BASIC II

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). $99.95/$15.

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). $179.95/$25.

ZEDIT

A character oriented text editor with 26 commands and "macro" capability for stringing multiple commands together. Included are a complete array of character move, add, delete, and display function. $49.95./$15.

ZTEL

Z80 Text Editing Language - Not just a text editor. Actually a language which allows you to edit text and also write, save, and recall programs which manipulate text. Commands include conditional branching, subroutine calls, iteration, block move, expression evaluation, and much more. Contains 36 value registers and 10 text registers. Be creative! Manipulate text with commands you write using Ztel. $79.95/$25.

TOP

A Z80 Text Output Processor which will do text formatting for manuals, documents, and other word processing jobs. Works with any text editor. Does justification, page numbering and headings, spacing, centering, and much more! $79.95/$25.

MACRO I

A macro assembler which will generate relocateable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. $79.95/$20.

MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. $99.95/$25.

LINKER

How many times have you written the same subroutine in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. $79.95/$20.

DEBUG I

Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. $79.95/$20.

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. $99.95/$20.

ZAPPLE

A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more! on disk

APPLE

8080 version of Zapple

NEW! TPM now available for TRS-80 Model II!

TPM*

A NEW Z80 disk operation system! This is not CP/M*. It's better! You can still run any program which runs with CP/M* but unlike CP/M* this operating system was written specifically for the Z80* and takes full advantage of its extra powerful instruction set. In other words its not warmed over 8080 code! Available for TRS-80* (Model I or II). Tarbell, Xitan DDDC, SD Sales "VERSA-FLOPPY", North Star (SD&DD), and Digital (Micro) Systems. $79.95/$25.

SYSTEM MONITOR BOARD (SMB II)

A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board $49.95/$20.

ROM FOR SMB II

2KX8 masked ROM of Zapple monitor. Includes source listing $34.95/$15.

PAYROLL (source code only)

The Osborne package. Requires C Basic 2.
5" disks $124.95 (manual not included)
8" disks $ 99.95 (manual not included)
Manual $20.00

ACCOUNTS PAYABLE/RECEIVABLE (source code only)

By Osborne, Requires C Basic 2
5" disks $124.95 (manual not included)
8" $99.95 (manual not included)
Manual $20.00

GENERAL LEDGER (source code only)

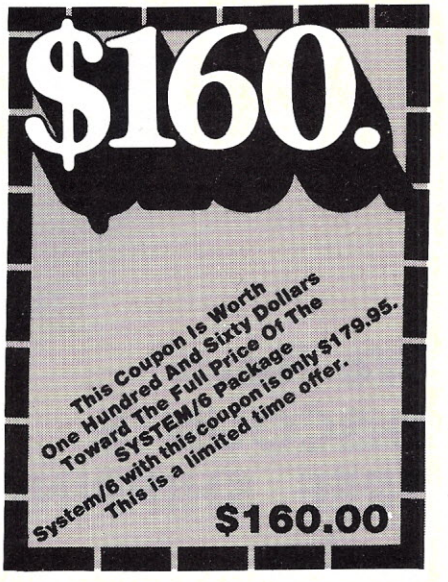
By Osborne. Requires C Basic 2
5" disks $99.95 (manual not included)
8" disks $99.95 (manual not included)
Manual $20.00

C BASIC 2

Required for Osborne software. $99.95/$20.

SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text editor.
Above purchased separately costs $339.75
Special introductory offer: Only $179.75 with coupon!!



ORDERING INFORMATION

Visa, Master Charge and C.O.D. O.K. To order call or write with the following information.

1. Name of Product (e.g. Macro I)
2. Media (e.g. 8" CP/M)
3. Price and method of payment (e.g. C.O.D.) include credit card info. if applicable.
4. Name, Address and Phone number.
5. For TPM orders only: Indicate if for TRS 80, Tarbell, Xitan DDDC, SD Sales (5¼" or 8"). ICOM (5¼" or 8"), North Star (single or double density) or Digital (Micro) Systems.
6. N.J. residents add 5% sales tax.

Manual cost applicable against price of subsequent software purchase in any item except for the Osborne software.

For information and tech queries call
609-599-2146

For phone orders ONLY call toll free
1-800-327-9191
Ext. 676
(Except Florida)

OEMS

Many CDL products are available for licensing to OEMs. Write to Carl Galletti with your requirements.

* Z80 is a trademark of Zilog
* TRS-80 is a trademark for Radio Shack
* TPM is a trademark of Computer Design Labs. It is not CP/M*
* CP/M is a trademark of Digital Research

Prices and specifications subject to change without notice.

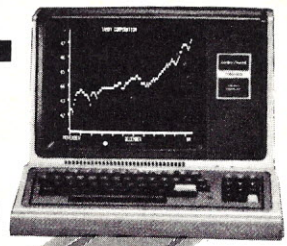
DEALER INQUIRIES INVITED.

COMPUTER DESIGN LABS

342 Columbus Avenue
Trenton, N.J. 08629

✓18

SAVE ON TRS-80's



Model I

from

Pan American Electronics, Inc.

A Radio Shack
AUTHORIZED SALES CENTER

We Have
DISCOUNTS
FREE SHIPPING
and a
TOLL FREE ORDER NUMBER
800/531-7466

Texas and Principle Number 512/581-2765
Telex Number 767339
Department K
1117 Conway
Mission, Texas 78572

MasterCard VISA

Model II

Model III

Color Computer

Pocket Computer

This barebones system provides instant access to information, and a way to keep your books balanced.

A Minimum Accounting System

By Gene Embry

The 18th century German poet Johann Wolfgang von Goethe wrote that double entry accounting "is one of the most beautiful inventions of the human spirit, and every good businessman should use it in his economic undertakings."

While today's authors of business software might not describe it in such poetic terms, double entry is still used to help modern merchants keep their books.

This article will explain how to use a minimum accounting system to set up a chart of accounts (COA) and a method of keeping the books in balance.

The Rules

The accounting rules this program follows are simple: The sum of all assets must equal the sum of all liabilities plus the sum of all equities, and each transaction must affect at least two accounts.

Assume we decided to form a company called SuperSoftware, Inc., to develop business software. Our first job is to develop an accounting system. We study our present needs and future requirements, and lay down the following guidelines for our system:

- It must be simple to use.
- All transactions will instantly update the COA.
- It must be easily expandable.
- It should provide an audit trail.
- It should provide for end-of-period procedures.

The second item means that we can check our profit and loss (P&L) statement and/or balance sheet after each transaction is entered into the system, and the books will be balanced. The fourth item lets us check on human input errors.

After some serious thought, we arrive at the major division in Table 1 for our (COA). A list of the individual accounts is shown in Table 2.

Our System

The system we decided to purchase comprises

- A 6800-based CPU with 32K RAM.
- A video terminal.
- A printer.
- A dual eight-inch floppy disk.

Smoke Signal Broadcasting Co. disk operating system (version 51) and Computerware's BASIC (version 8.5) fill our immediate needs for a good DOS and a flexible high-level language.

First, we must determine what information we need to save. We'll need a general data file to store variables that will be passed between programs, and other variables such as the number of records used in a data file, dates, identification numbers and flags. A file of 25 records, with each record containing two numerics and one string variable will be sufficient for our needs. This file will be named MASTER.DAT.

Account No.	Type of Account
100–199	Asset
200–299	Liability
300–399	Equity
400–499	Sales
500–599	Cost of merchandise sold
600–699	Expenses
700–799	Other income
800–899	Other expenses

Table 1. Major divisions of COA accounts.

Each account of the COA will be stored in a file named CHART.DAT. Each record will contain four numerics and one string.

One file will be needed to store transactions. This file, TRANS.DAT, will contain 50 records, and each record will have five numerics and one string.

The assignment of the locations used in the file MASTER.DAT is shown in Table 3. Note that record 2, field 1, shows a formatted date stored as a numeric, which is configured as eight digits with the first four digits the year, the next two digits the month and the last two the day of the month. This method is always used and has many advantages.

Computerware's technique of creating random files is in accordance with the following formula:

bytes per record = 6*N + S*(L + 1).

N = number of numerics per record, S = number of strings per record, and L = length of each string.

We will format each record in the file CHART.DAT in the following manner:

A = Account number
A$ = Account description
B = Current balance
C = Year-to-date balance
D = Spare

Gene Embry, Route 1, Box 151-H, Morrisville, NC 27560.

Table 2. Chart of accounts.

	ACCT. #	DESCRIPTION	CURRENT	BALANCE
1	100	CHECKING		95094.05
2	103	PETTY CASH		0.00
3	106	PREPAID INSURANCE		0.00
4	107	PREPAID INTEREST		0.00
5	108	INSURANCE - CASH VALUE		0.00
6	110	A/R - TRADE		75.00
7	111	A/R - EMPLOYEES		0.00
8	120	INVENTORY		0.00
9	150	LAND		0.00
10	160	DEPRECIABLE ASSETS		5000.00
11	161	LESS DEPRECIATION CLAIMED		0.00
12	180	DEFERRED INTEREST EXPENSE		0.00
13	185	ORGANIZATIONAL EXPENSE		0.00
14	200	ACCOUNTS PAYABLE		0.00
15	205	FICA WITHHELD		0.00
16	206	FED. TAX WITHHELD		0.00
17	207	STATE TAX WITHHELD		0.00
18	208	STATE - UNEMP TAX		0.00
19	209	FED. UNEMP TAX		0.00
20	217	ACCRUED INTEREST PAYABLE		0.00
21	220	NOTE #1 PAYABLE		0.00
22	222	NOTE #2 PAYABLE		0.00
23	300	CAPITAL		100000.00
24	310	RETAINED EARNINGS		169.05
25	399	NET PROFIT		0.00
26	400	CASH - SALES	0.00	100.00
27	401	SALES - ON ACCOUNT	0.00	75.00
28	500	COST OF MDSE. SOLD	0.00	0.00
29	600	ADVERTISING & SALES PROM.	0.00	0.00
30	602	ACCOUNTING & AUDIT FEES	0.00	0.00
31	604	BANK SERVICE CHARGE	0.00	0.00
32	606	DATA PROCESSING	0.00	0.00
33	610	DEPRECIATION	0.00	0.00
34	614	DONATION	0.00	0.00
35	616	DUES & SUBSCRIPTION	0.00	0.00
36	617	FREIGHT	0.00	5.95
37	620	INSURANCE	0.00	0.00
38	624	INTEREST	0.00	0.00
39	630	LEGAL	0.00	0.00
40	634	MAINTENANCE	0.00	0.00
41	637	INVENTORY SHORTAGE	0.00	0.00
42	638	OFFICE SUPPLIES	0.00	0.00
43	640	PAYROLL	0.00	0.00
44	648	PAYROLL TAXES	0.00	0.00
45	658	POSTAGE	0.00	0.00
46	660	RENT	0.00	0.00
47	666	TELEPHONE & TELEGRAPH	0.00	0.00
48	668	TRAVEL & ENTERTAINMENT	0.00	0.00
49	676	UTILITIES	0.00	0.00
50	700	INTEREST INCOME	0.00	0.00
51	710	RENTAL INCOME	0.00	0.00
52	720	CASH OVER OR SHORT	0.00	0.00
53	730	SALE OF ASSETS	0.00	0.00
54	805	BAD DEBTS	0.00	0.00
55	810	PENALITIES	0.00	0.00
56	820	COST OF ASSETS SOLD	0.00	0.00
57	830	MISCELLANEOUS EXPENSES	0.00	0.00

MASTER.DAT File Contents
March 1, 1980

REC.#			
1	RESERVED=0	RESERVED=0	MONTH=January
2	TODAY'S DATE FORMATTED=19800301	JULIAN DAY=2444301	MONTH=February
3	RESERVED=0	RESERVED=0	MONTH=March
4	RESERVED=0	RESERVED=0	MONTH=April
5	RESERVED=0	RESERVED=0	MONTH=May
6	RESERVED=0	# IN TRANS.DAT=6	MONTH=June
7	PROFIT - P&L=0	END OF MONTH FLAG=0	MONTH=July
8	RESERVED=0	RESERVED=0	MONTH=August
9	RESERVED=0	RESERVED=0	MONTH=September
10	RESERVED=0	SPARE=0	MONTH=October
11	RESERVED=0	RESERVED=0	MONTH=November
12	RESERVED=0	RESERVED=0	MONTH=December
13	SPARE=0	SPARE=0	NAME=SuperSoftware, Inc.
14	SPARE=0	SPARE=0	TODAY-READABLE=March 1, 1980
15	SPARE=0	SPARE=0	SPARE=
16	SPARE=0	SPARE=0	SPARE=
17	SPARE=0	SPARE=0	SPARE=
18	SPARE=0	SPARE=0	SPARE=
19	SPARE=0	SPARE=0	SPARE=
20	SPARE=0	SPARE=0	SPARE=
21	SPARE=0	SPARE=0	RESERVED=
22	SPARE=0	SPARE=0	ADDRESS=312 Green Street
23	SPARE=0	SPARE=0	CITY-STATE-ZIP=Carpenter, NC 27560
24	SPARE=0	SPARE=0	RESERVED=
25	SPARE=0	SPARE=0	RESERVED=

Table 3. MASTER.DAT data file.

Program Name	Purpose
BEGIN	Operator input of today's date.
LEDGER.BAS	The main menu program.
INCOME.BAS	Prints the income statement (P&L).
BALANC.SHT	Prints the balance sheet.
TRANS.BAS	Operator input of all transactions.
TRANS.PRT	Prints the transaction report.

Table 4. Main programs.

Each record in file TRANS.DAT will be stored as follows:

A = The account number to take money from
B = The account number to transfer the money to
A$ = Description of the transaction
C = Date of transaction
D = Dollar amount of the transaction
E = The check number, if the transaction is a check.

Next we'll determine what programs we'll need and how the programs will interact with each other. A menu-driven system will be best. The main working programs are shown in Table 4.

Four other programs will be needed to complete our minimum accounting package. One program, INIT.BAS, will be used only one time to create the three data files and to get the name and address of our company. All the account numbers and descriptions are contained in DATA statements. You may add or delete accounts freely. The three constraints are that the account numbers be stored in ascending order, that no commas be used in the description, and that accounts be limited to 255. After INIT.BAS is finished, program BEGIN is called and executed.

Another program, CHART.COR, will let you insert commas to your heart's content. CHART.COR will also let you obtain a listing of all the information contained in the file CHART.DAT and to make corrections. CHART.COR will only be called if there is an error in the books. Following the completion of CHART.COR, it will return to the main menu program, LEDGER.BAS.

RESET.COA is a short program to set all money fields in CHART.DAT to zero. It is never called by any of the programs, and is used mainly during

the testing of the system software.

The final program, MASTER.CHG, is used to get a printout of the data in MASTER.DAT and to change values in the file. It may be called using LEDGER.BAS, and returns to LEDGER.BAS when completed.

Key Point

How do we determine if the books are balanced? The main purpose of an income statement is to report the current period profit or loss. The net profit, as determined from the income statement, is equal to the sum of all sales plus other income minus the cost of merchandise sold minus operating expenses minus other expenses. Note that this will include only accounts that are numbered 400 and greater.

The balance sheet is a historical money summary of everything that has happened to the company since its beginning. We will define the retained earnings account (310) as the sum of all end-of-period profits and losses for the corporation. The net profit (399), as determined from the balance sheet, will be the sum of all accounts from 100 to 199 minus the sum of all accounts from 200 to 299 minus the sum of all accounts from 300 to 398. After calculating net profits, using two completely different sets of numbers, we compare them. If they are equal, the books are in balance.

The BEGIN Program

BEGIN should be the first program called each day. It gets today's date from the operator and calculates the Julian day based on this input. You will find the Julian day calculation a very nice way to age accounts receivable and accounts payable and to calculate interest. Various tests on the inputs are made, but they are by no means complete. The BASIC statement DLM = OFF allows commas inside a string. In all programs, we will be using the default value of STRING = 32. This program is shown in Listing 1.

The LEDGER.BAS Program

This is the main menu program. See Sample 1. Note the generalized technique of printing out the menu in lines 150–156 (see Listing 2). The addition or deletion of items to the menu only requires insertion or deletion of a DATA line. The colon (:) is the equivalent of a remark statement. Lines 1030 to 1050 show some future

Sample 1. Main menu.

```
                SuperSoftware, Inc.
                  March 1, 1980

              Minimum Accounting System

   1 . Post Transactions              2 . Post Checks Written
   3 . Print Transactions             4 . Print Check Register
   5 . Print Income Statement         6 . Print Balance Sheet
   7 . Access COA file                8 . Terminate

   MAKE SELECTION  ?
```

Sample 2. P&L statement.

```
**************************************************************************
                        SuperSoftware, Inc.

  INTERIM REPORT
                              INCOME STATEMENT

                              March 1, 1980

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                              CURRENT     CURRENT     Y-T-D       Y-T-D
                              BALANCE     PERCENT     BALANCE     PERCENT
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

                          REVENUE FROM SALES
CASH - SALES                      0.00        0.00      100.00       57.14
SALES - ON ACCOUNT                0.00        0.00       75.00       42.85
  NET REVENUE FROM SALES          0.00        0.00      175.00      100.00

                            COST OF SALES
COST OF MDSE. SOLD                0.00        0.00        0.00        0.00
  TOTAL COST OF SALES             0.00        0.00        0.00        0.00

  ********************
  GROSS PROFIT ON SALES           0.00        0.00      175.00      100.00
  ********************

                          OPERATING EXPENSES
ADVERTISING & SALES PROM.         0.00        0.00        0.00        0.00
ACCOUNTING & AUDIT FEES           0.00        0.00        0.00        0.00
BANK SERVICE CHARGE               0.00        0.00        0.00        0.00
DATA PROCESSING                   0.00        0.00        0.00        0.00
DEPRECIATION                      0.00        0.00        0.00        0.00
DONATION                          0.00        0.00        0.00        0.00
DUES & SUBSCRIPTION               0.00        0.00        0.00        0.00
FREIGHT                           0.00        0.00        5.95        3.40
INSURANCE                         0.00        0.00        0.00        0.00
INTEREST                          0.00        0.00        0.00        0.00
LEGAL                             0.00        0.00        0.00        0.00
MAINTENANCE                       0.00        0.00        0.00        0.00
INVENTORY SHORTAGE                0.00        0.00        0.00        0.00
OFFICE SUPPLIES                   0.00        0.00        0.00        0.00
PAYROLL                           0.00        0.00        0.00        0.00
PAYROLL TAXES                     0.00        0.00        0.00        0.00
POSTAGE                           0.00        0.00        0.00        0.00
RENT                              0.00        0.00        0.00        0.00
TELEPHONE & TELEGRAPH             0.00        0.00        0.00        0.00
TRAVEL & ENTERTAINMENT            0.00        0.00        0.00        0.00
UTILITIES                         0.00        0.00        0.00        0.00
  TOTAL OPERATING EXPENSE         0.00        0.00        5.95        3.40

  ********************
  NET OPERATING INCOME            0.00        0.00      169.05       96.60
  ********************

                          OTHER INCOME
INTEREST INCOME                   0.00        0.00        0.00        0.00
RENTAL INCOME                     0.00        0.00        0.00        0.00
CASH OVER OR SHORT                0.00        0.00        0.00        0.00
SALE OF ASSETS                    0.00        0.00        0.00        0.00
  TOTAL - OTHER INCOME            0.00        0.00        0.00        0.00

                          OTHER EXPENSES
BAD DEBTS                         0.00        0.00        0.00        0.00
PENALITIES                        0.00        0.00        0.00        0.00
COST OF ASSETS SOLD               0.00        0.00        0.00        0.00
MISCELLANEOUS EXPENSES            0.00        0.00        0.00        0.00
  TOTAL - OTHER EXPENSES          0.00        0.00        0.00        0.00

NET PROFIT (LOSS)                 0.00        0.00      169.05       96.60
**************************************************************************
```

expansion we might want to make. When we get our payroll program all we need do is remove the colon in line 1030 and our menu will be current.

The INCOME.STM Program

The P&L statement will be printed out on the port number you select. You must tell the program if it is the end of the month during the course of its execution. If it is the end of the month, we store a flag (lines 30–40) so the BALANC.SHT program knows it. If it is not the end of the month, the report will print the word INTERIM in the header. (In the expanded version we might also use this information to automatically update the COA for any depreciable assets we have.)

After certain program variables are obtained (lines 9800–9890), we enter into routine 1000–1090 to get the current period totals and year-to-date totals for all account numbers greater than 399. The remainder of the program prints out, in a nice format, the necessary information for the income statement. The last line of the report prints the net profit or loss as previously defined. Sample 2 shows a typical income statement. This program is shown in Listing 3.

Sample 3. Balance sheet.

```
                    SuperSoftware, Inc.

                        BALANCE SHEET

                        March 1, 1980


ASSETS

     ** CURRENT ASSETS **
CHECKING                          95094.05
PETTY CASH                            0.00
PREPAID INSURANCE                     0.00
PREPAID INTEREST                      0.00
INSURANCE - CASH VALUE                0.00
A/R - TRADE                          75.00
A/R - EMPLOYEES                       0.00
INVENTORY                             0.00
 TOTAL CURRENT ASSETS                          95169.05

     ** FIXED ASSETS **
LAND                                  0.00
DEPRECIABLE ASSETS                 5000.00
LESS DEPRECIATION CLAIMED             0.00
 NET FIXED ASSETS                             5000.00

     ** OTHER ASSETS **
DEFERRED INTEREST EXPENSE             0.00
ORGANIZATIONAL EXPENSE                0.00
 TOTAL OTHER ASSETS                              0.00


     ************
     TOTAL ASSETS                                          100169.05
     ************


LIABILITIES AND STOCKHOLDERS' EQUITY


     ** CURRENT LIABILITY **
ACCOUNTS PAYABLE                      0.00
FICA WITHHELD                         0.00
FED. TAX WITHHELD                     0.00
STATE TAX WITHHELD                    0.00
STATE - UNEMP TAX                     0.00
FED. UNEMP TAX                        0.00
ACCRUED INTEREST PAYABLE              0.00
 TOTAL CURRENT LIABILITIES                       0.00

     ** LONG TERM LIABILITIES **
NOTE #1 PAYABLE                       0.00
NOTE #2 PAYABLE                       0.00
 TOTAL LONG TERM LIABILITIES                     0.00


     ** STOCKHOLDERS' EQUITY **
CAPITAL                          100000.00
RETAINED EARNINGS                   169.05
NET PROFIT                            0.00
 TOTAL STOCKHOLDERS' EQUITY                  100169.05


     ************************************
     TOTAL LIABILITY & STOCKHOLDERS' EQUITY                100169.05
     ************************************
BOOKS ARE IN BALANCE. GOOD WORK.
```

The BALANC.SHT Program

This program may only be entered after running INCOME.STM. Following the printout (see Sample 3), a test of the two net profits is made (lines 560–570). If they are not equal, a report of the absolute difference is printed out and CHART.COR is called. If they are equal and it is the end of the month, the current balances of accounts 400 and greater are set to zero. If they are equal you are congratulated and LEDGER.BAS is called. The program is shown in Listing 4.

The TRANS.BAS Program

This will record all transactions, where money is shifted from one COA to another, and save the information in TRANS.DAT. If the transaction involves a check being written, we assume the money will be taken out of account 100, checking. Since amounts can be transferred from any account to any other account, we need a method to determine whether we should add or subtract the amount involved from the second account.

We will always subtract the amount of money involved from the first account (the From Account). Whether to add or subtract to the second account (the To Account) is based on how the net profit will be affected by the amount of money being subtracted from the From Account. The current value of the array D(8,8), which contains only plus or minus ones, and the first number of the accounts determine whether to add or to subtract from the To Account. This is accomplished in lines 5000–5090. For proper operation of this program the coding of lines 9900–9924 must be absolutely correct.

You will find that negative dollars will be processed in the same manner as positive dollars. Thus, negative amounts are permitted in any account. This program is shown in Listing 5.

The TRANS.PRT Program

This program will print out a report of all records stored in TRANS.DAT. Following the printout and before returning to LEDGER.BAS, you may reset the pointer to 0. An alternative method of reset is to execute program MASTER.CHG and set the pointer to

FMG CORPORATION NOW CARRIES GRAHAM-DORIAN & PEACHTREE SOFTWARE

FMG CORPORATION
P.O. Box 16020
Fort Worth, Texas
76133
(817) 294-2510

VISA · master charge

✓70

M-530

All FMG Software Products Include All Necessary Manuals

NEW VERSATILITY For Your TRS-80

CP/M®2

CONTROL PROGRAM FOR MICROCOMPUTERS ENABLING YOU TO RUN SOFTWARE PUBLISHED FOR CP/M 1.4 ON THE TRS-80

CP/M is considered the industry standard disk operating system because it gives you the hardware-independent interface you need to make your computer work for you. CP/M 2.0 is the latest in the evolution of a proven reliable and efficient software system. FMG CORPORATION NOW OFFERS THE CP/M 2.0 FOR THE TRS-80 .
It features an enhanced upward compatible file system and powerful new random access capabilities. The CP/M 2.0 from FMG provides the ability to run software published for the CP/M system, on the TRS-80 Model II. From minidisks, floppy disks, all the way to high-capacity hard disks, the flexibility of CP/M 2.0 makes it a truly universal operating system. The package includes an 8" system disk, editor, assembler and debugger for the TRS-80

Available in Format A, B, C, G only ... **$200/$25**

MP/M™

MULTI-PROGRAMMING MONITOR

NEW INDUSTRY STANDARD

A deluxe operating system that provides big computer facilities at small computer prices. MP/M is a monitor program which operates with your microcomputer to provide multi-terminal access with multi-programming at each terminal. Best of all, it's CP/M compatible which means you can run a wide variety or programming languages, applications packages, and development software.

You can run simultaneous editors, program translators, and background printer spoolers. Or you can use MP/M for data entry or data-base access from remote terminals. Or you can use MP/M real-time features to monitor an assembly line and automatically schedule programs for execution throughout the day. MP/M makes an excellent focal point for a cluster of connected microcomputers. The possibilities are limitless.

(Format B) ..... **$450/$35**
(Format G) ..... **$300/$35**

*CP/M and MP/M are trademarks of Digital Research.
Z90 is a trademark of Zilog, Inc.
TRS-80 is a trademark of Tandy Corp.
Pascal/M is a trademark of Sorcim.

· MICROPRO INTERNATIONAL

SOFTWARE WITH MANUAL / MANUAL ALONE

(M) **SUPER-SORT I** — Sort, merge, extract utility as absolute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD, Packed Decimal, EBCDIC, ASCII, floating & fixed point, exponential, field justified, etc. Even variable number of fields per record! . **$225/$25**

SUPER-SORT II — Above available as absolute program only ..... **$175/$25**

SUPER-SORT III — As II without SELECT/EXCLUDE ..... **$125/$25**

WORD-STAR — Menu driven visual word processing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning ..... **$495/$40**

WORD-STAR Customization Notes — For sophisticated users who do not have one of the many standard terminal or printer configurations in the distribution version of WORD-STAR ..... **NA/$95**

WORD-MASTER Text Editor — In one mode has superset of CP/M's ED commands including global searching and replacing, forwards and backwards in file in video mode, provides full screen editor for users with serial addressable-cursor terminal ..... **$150/$25**

FLOPPY SAVER — Protection for center holes of 5" and 8" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool and tough 7 mil mylar reinforcing rings for 25 diskettes.

5", Kit **$14.95**
5", Rings only **$7.95**
8", Kit **$16.95**
8", Rings only **$8.95**

HEAD CLEANING DISKETTE — Cleans the drive Read/Write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use.

8" **$32.00**
5¼" **$30.00**

(M) · **DESPOOL** — Allows flexibility and efficiency. (Disk file printing can be accomplished while simultaneously using the computer for other tasks) Slower printers do not tie up the computer. Requires 32K minimum ..... **$75/$10**

(M) · **SCREEN EDIT** — Text editor for program entry — allows user the ability to see entries as they are being made. Has command which enables user to move the viewed position of the file anywhere within the current data file OR add information anywhere in the file. Requires 16K minimum ..... **$125/$25**
(Also available in TRS DOS format.
Specify model or TRS-80)

(M) · **MAC** — Disk-based, powerful macro assembler utilizes Standard Intel Mnemonics. Includes macro processor.
The CP/M 8080 Macro Assembler reads assembly language statement from a diskette file and produces an Intel "HEX" format object file on the disk suitable for processing in the TRS-CP/M environment. Requires 32K minimum and CP/M ..... **$100/$25**

(M) · **ZSID** — Efficient and reliable program testing system for Z80 microcomputers. Capabilities include traceback and histogram facilities. Allows real time break points.
ZSID is a symbolic debugger which expands upon the features of the TRS-CP/M standard debugger, providing greatly enhanced facilities for assembly language program check-out. Requires 32K minimum and CP/M ..... **$99/$25**

(M) **MAIL LIST** — Mailing list maintenance package. No sorting required to print normal address labels in zip code sequence. Supports new larger zip code. Sorts and selects on multiple fields. Labels may be printed in user selectable formats. Includes sort and select utilities **$300/$35**

· PEACHTREE SOFTWARE SYSTEMS

(T) **GENERAL LEDGER** — Records details of all financial transactions. Generates a balance sheet and an income statement. Flexible and adaptable design for both small businesses and firms performing client writeup services. Produces reports as follows: Trial Balance, Transaction Registers, Balance Sheet, Prior Year Comparative Balance Sheet, Income Statement, Prior Year Comparative Income Statement and Department Income Statements. Interactive with other PEACHTREE accounting packages. Supplied in source code for Microsoft BASIC ..... **$990/$30**

(T) **ACCOUNTS PAYABLE** — Tracks current and aged payables and incorporates a check writing feature. Maintains a complete vendor file with information on purchase orders and discount terms as well as active account status. Produces reports as follows: Open Voucher Report, Accounts Payable Aging Report and Cash Requirements. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft. BASIC ..... **$990/$30**

(T) **ACCOUNTS RECEIVABLE** — Generates invoice register and complete monthly statements. Tracks current and aged receivables. Maintains customer file including credit information and account status. The current status of any customer account is instantly available. Produces reports as follows: Aged Accounts Receivable, Invoice Register, Payment and Adjustment Register and Customer Account Status Report. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft BASIC . **$990/$30**

(T) **PAYROLL** — Prepares payroll for hourly, salaried and commissioned employees. Generates monthly, quarterly and annual returns. Prepares employee W-2's. Includes tables for federal withholding and FICA as well as withholding for all 50 states plus up to 20 cities from pre-computed or user generated tables. Will print checks, Payroll Register, Monthly Summary and Unemployment Tax Report. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft BASIC ..... **$990/$30**

(T) **INVENTORY** — Maintains detailed information on each inventory item including part number, description, unit of measure, vendor and reorder data, item activity and complete information on current item costs, pricing and sales. Produces reports as follows: Physical Inventory Worksheet, Inventory Price List, Departmental Summary Report, Inventory Status Report, The Reorder Report and the Period-to-Date and Year-to-Date reports. Supplied in source code for Microsoft BASIC ..... **$1,190/$30**

(T) **MAILING ADDRESS** — Keeps track of name and address information and allows the selective printing of this information in the form of mailing lists or address labels. Allows the user to tailor the system to his own particular requirements. User-defined format and print-out system uses a special format file which tells programs how to print the mailing list or address labels. Standard format files are included with system. Automatic sorting of data uses indexed file management routines which allow the name and address information to be sequentially retrieved and printed without file sorting. Supplied in source code for Microsoft BASIC ..... **$790/$30**

· GRAHAM-DORIAN SOFTWARE SYSTEMS

(T) **GENERAL LEDGER** — An on-line system; no batching is required. Entries to other GRAHAM-DORIAN accounting packages are automatically posted. User establishes customized C.O.A. Provides transaction register, record of journal entries, trial balances and monthly closings. Keeps 14 month history and provides comparison of current year with previous year. Requires CBASIC-2. Supplied in source ... **$995/$35**

(T) **ACCOUNTS PAYABLE** — Maintains vendor list and check register. Performs cash flow analysis. Flexible — writes checks to specific vendor for certain invoices or can make partial payments. Automatically posts to GRAHAM-DORIAN General Ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source ..... **$995/$35**

(T) **ACCOUNTS RECEIVABLE** — Creates trial balance reports, prepares statements, ages accounts and records invoices. Provides complete information describing customer payment activity. Receipts can be posted to different ledger accounts. Entries automatically update GRAHAM-DORIAN General Ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source ..... **$995/$35**

(T) **PAYROLL SYSTEM** — Maintains employee master file. Computes payroll withholding for FICA, Federal and State taxes. Prints payroll register, checks, quarterly reports and W-2 forms. Can generate ad hoc reports and employee form letters with mail labels. Requires CBASIC-2. Supplied in source ..... **$590/$35**

(T) **INVENTORY SYSTEM** — Captures stock levels, costs, sources, sales, ages, turnover, markup, etc. Transaction information may be entered for reporting by salesman, type of sale, date of sale, etc. Reports available both for accounting and decision making. Requires CBASIC-2. Supplied in source ... **$590/$35**

(T) **JOB COSTING** — Designed for general contractors. To be used interactively with other GRAHAM-DORIAN accounting packages for tracking and analysing expenses. User establishes customized cost categories and job phases. Permits comparison of actual versus estimated costs. Automatically updates GRAHAM-DORIAN General Ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source **$995/$35**

Sample Program Disk For Each Graham-Dorian Business Package. Specify Package **$45**

The sale of each proprietary software package conveys a license for use on one system only.

Prices F.O.B. Fort Worth, Tex. Shipping, handling and C.O.D. charges extra.

· MICROSOFT PRODUCTS

(M) **BASIC-80** — Disk Extended BASIC, ANSI compatible with long variable names, WHILE/WEND, chaining, variable length file records ..... **$350/$25**

(M) **BASIC COMPILER** — Language compatible with BASIC-80 and 3-10 times faster execution. Produces standard Microsoft relocatable binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules ..... **$395/$25**

(M) **FORTRAN-80** — ANSI 66 (except for COMPLEX) plus many extensions. Includes relocatable object compiler, linking loader, library with manager. Also includes MACRO-80 (see below) ..... **$500/$25**

(M) **COBOL-80** — Level 1 ANSI '74 standard COBOL plus most of Level 2. Full sequential, relative, and indexed file support with variable file names. STRING, UNSTRING, COMPUTE, VARYING/UNTIL, EXTEND, CALL, COPY, SEARCH, 3-dimensional arrays, compound and abbreviated conditions, nested IF. Powerful interactive screen-handling extensions. Includes compatible assembler, linking loader, and relocatable library manager as described under MACRO-80 ..... **$750/$25**

(M) **MACRO-80** — 8080/Z80 Macro Assembler. Intel and Zilog mnemonics supported. Relocatable linkable output. Loader, Library Manager and Cross Reference List utilities included ..... **$150/$25**

(M) **XMACRO-86** — 8086 cross assembler. All Macro and utility features of MACRO-80 package. Mnemonics slightly modified from Intel ASM86. Compatibility data sheet available ..... **$300/$25**

(M) **PASCAL/M*** — Compiler generates P code from extended language, implementation of standard PASCAL. Supports overlay structure through additional procedure calls and the SEGMENT procedure type. Provides convenient string handling capability with the added variable type STRING. Untyped files allow memory image I/O. Requires 56K CP/M .... **$150/$20**

(M) **PASCAL/Z** — Z80 native code PASCAL compiler. Produces optimized, ROMable re-entrant code. All interfacing to CP/M is through the support library. The package includes compiler, Microsoft Compatible relocating assembler and linker, and source for all library modules. Variant records, strings and direct I/O are supported. Requires 56K CP/M and Z80 CPU. ..... **$395/$25**

(M) **PASCAL/MT** — Subset of standard PASCAL. Generates ROMable 8080 machine code. Symbolic debugger included. Supports interrupt procedures, CP/M file I/O and assembly language interface. Real variables can be BCD, software floating point, or AMD 9511 hardware floating point. Version 3 includes Enumeration and Record data types. Manual explains BASIC to PASCAL conversion. Source for the runtime package requires Digital Research's MAC. Requires 32K ..... **$250/$30**

(M) **CBASIC-2** Disk Extended BASIC — Non-interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file control, chaining, integer and extended precision variables, etc. ..... **$110/$15**

(M) **BSTAM** — Utility to link one computer to another also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it! It's great! Full wildcard expansion to send ★.COM, etc. 9600 baud with wire, 300 baud with phone connection. **Both** ends need one. Standard and (M) versions can talk to one another. ..... **$150/$5**

(M) (T) **SELECTOR III-C2** — Data Base Processor to create and maintain multi Key data bases. Prints formatted sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC-2. Supplied in source ..**$349/$20**

GLECTOR — General Ledger option to SELECTOR III-C2. Interactive system provides for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L statements and journals. Two year record allows for statement of changes in financial position report. Supplied in source. Requires SELECTOR III-C2, CBASIC-2 and 52K system ..... **$250/$25**

(M) **TEXTWRITER III** — Text formatter to justify and paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Pencil* prepared files. ..... **$125/$20**

ORDERS MUST SPECIFY DISK SYSTEMS AND FORMATS:

FORMATS AVAILABLE:
(A) TRS-80 Model I (M) Keys Only
(B) TRS-80 Model II
(C) TRS-80 Model III (M) Keys Only
(D) HEATHKIT H89 (M) Keys Only
(E) NORTH STAR
(F) SUPER BRAIN QD
(G) STANDARD UNIMPLEMENTED

(M) Modified version available for use with CPM as implemented on Heath and TRS-80 Model I computers.

(T) For all (T) items listed above, the recommended system configuration consists of 48K CPM 2 full dize disk drives. 24 x 80 CRT and 132 column printer.

FMG's LIBRARY:

PASCAL USER MANUAL & REPORT
(2nd) Edition by K. Jensen and N. Wirth

- **Tutorial Manual and Concise Reference Report for Both Programmers and Implementors**
- **Includes Helpful Examples to Demonstrate the Various Features of PASCAL**

The book consists of two parts: the user manual and the revised report. The manual is directed to those who have some familiarity with computer programming and who wish to get acquainted with the PASCAL language. The report defines standard PASCAL, which constitutes a common base between various implementations of the language.

Stock No. #B21 — **Price** $9.95

PASCAL PRIMER Problem Solving

This book has three major goals:

- **To introduce all aspects of the programming and problem solving process (includes problem specification and organization, algorithms, coding, debugging, testing, documentation and maintenance);**
- **To teach good programming style and how to produce a high quality finished product; and**
- **To teach the syntax of the PASCAL programming language.**

Numerous examples are employed throughout the text. PASCAL is used as a vehicle to teach various aspects of programming techniques.

Stock No. #B24 — **Price** $18.95

Microcomputer Problem Solving Using Pascal
by Kenneth L. Bowles

- **A Book Designed for Both College Courses AND Individual Self-Study**
- **Ideal for use with UCSD Pascal**
- **Includes Extensions to Standard PASCAL**

This book is designed both for introductory courses in computer problem solving at the freshman and sophomore college level, and for individual self-study. It includes many examples and actually complete programs. It includes information on the necessary functions and procedures for handling graphics and strings.

Stock No. #B22 — **Price** $14.95

BEGINNER'S MANUAL FOR UCSD PASCAL SYSTEM

- **An Enlightening Introduction to UCSD PASCAL**
- **Demonstrates How to Use the UCSD PASCAL System and How to Program in PASCAL**
- **Includes Many Practical Examples of PASCAL Programs**

This book is intended to be used as an introduction and reference manual for people just beginning to use the UCSD Pascal Software System. Whether you have never used a computer before or whether you are an experienced programmer who is unfamiliar with UCSD PASCAL, this book will provide a relatively easy, yet thorough, introduction to UCSD PASCAL.

Stock No. #B25 — **Price** $11.95

PROGRAMING IN PASCAL
by Peter Grogono

- **An Excellent Introduction to One of the Fastest Growing Programming Languages Today**
- **Sections on Procedures and Files PLUS a Chapter on Dynamic Data Structures such as Trees and Linked Lists**

The text is arranged as a tutorial, containing both examples and exercises to increase reader proficiency in PASCAL. Concepts are illustrated by examples, ranging from the Tower of Hanoi problem to circumscribing a circle about a triangle. PROGRAMMING IN PASCAL is sure to hold the reader's interest.

Stock No. #B23 — **Price** $14.95

UCSD Reference Book

- **A Reference Guide to the Complete UCSD PASCAL System**
- **Includes Information on Compiler Basic, Assembler and Editor**
- **Lists Actual P-Machine Codes**

This reference book can be a valuable and time-saving guide to through information on the UCSD PASCAL system. The easy-to-read manual provides fast access to pertinent data.

Stock No. #B26 — **Price** $25.00

0 manually (record number 6). This program is shown in Listing 6.

Expanding the System

Several items will immediately enhance this system. For instance, if during the saving of each transaction we also saved in another file the date and record number of each transaction, we could have a report of each transaction sorted by date. We could also save each account number of each transaction, and then sort by account number. This would give us a report of transactions by account number. TRANS.PRT could be expanded to print only checks and/or intra-chart transactions.

The addition of a payroll program which would update all accounts would save lots of time. We would also like to know what our federal and state tax liabilities are. If we owe payroll taxes, then a program to tell us which forms to use, when they are due and all other information would be of great value. If our business is going to include accounts receivable, accounts payable and inventory, we must, of course, add those at some time in the future.■

Sample 4. Transaction file.

```
                    SuperSoftware, Inc.

                Transactions by ORDER ENTERED

TODAY'S DATE:              March 1, 1980

   DATE       ACCOUNT #          DESCRIPTION              AMOUNT       CK. #
 1. 1/1/80        300         CAPITAL                   -50000.00
                  100         CHECKING
PURPOSE: Sold stock

 2. 1/1/80        300         CAPITAL                   -50000.00
                  100         CHECKING
PURPOSE: Sold more stock to you.

 3. 1/2/80        100         CHECKING                    5000.00        100
                  160         DEPRECIABLE ASSETS
PURPOSE: Bought 6800 cpu system

 4. 1/3/80        100         CHECKING                       5.95        101
                  617         FREIGHT
PURPOSE: Freight UPS-cpu system

 5. 1/20/80       400         CASH - SALES                -100.00
                  100         CHECKING
PURPOSE: Sold First Program

 6. 1/22/80       401         SALES - ON ACCOUNT           -75.00
                  110         A/R - TRADE
PURPOSE: Sold on account 2nd pgm
```

Listing 1. BEGIN program.

```
0001 : BEGIN
0002 :
0005 : Embry  3/1/80
0006 :
0007 : Kb article
0008 :
0010 HOME
0014 PRINT "Hello!"
0016 PRINT
0018 PRINT "Ready to have another go at it, I see."
0020 PRINT
0099 :
0100 : Inputs
0101 :
0110 PRINT "Input Today's Date"
0112 PRINT
0120 INPUT "Month ",M
0130 IF M<1 THEN PRINT CHR$(7):GOTO 110
0140 IF M>12 THEN PRINT CHR$(7):GOTO 110
0150 LET M$=STR$(M)
0160 IF LEN(M$)<2 THEN M$="0"+M$
0199 :
0200 INPUT "Day ",D
0210 IF D<1 THEN PRINT CHR$(7):GOTO 200
0220 IF D>31 THEN PRINT CHR$(7):GOTO 200
0230 LET D$=STR$(D)
0240 IF LEN(D$)<2 THEN D$="0"+D$
0299 :
0300 INPUT "Year ",Y
0301 :
0310 IF Y<0 THEN PRINT CHR$(7):GOTO 300
0320 IF Y<100 THEN Y=1900+Y
0330 LET Y$=STR$(Y)
0340 IF LEN(Y$)<>4 THEN 300
0399 :
0400 : FORMAT DATE
0401 :
0410 LET T$=Y$+M$+D$::Format date in decreasing order  (YYYYMMDD)
0420 LET T=VAL(T$)
0430 LET D=VAL(D$):D$=STR$(D)::Get rid of leading 0's
0499 :
0500 : JULIAN DAY
0501 :
0510 LET J=D-32075+1461*(Y+4800+(M-14)/12)/4
0520 LET J=J+367*(M-2-(M-14)/12*12)/12
0530 LET J=J-3*((Y+4900+(M-14)/12)/100)/4
0540 LET J=INT(J)
0599 :
0600 : Save it
```

More →

****SPECIAL**SPECIAL****
TRS-80 ADD ON DRIVES
IMMEDIATE DELIVERY

SINGLE SIDED $225.00
DOUBLE SIDED $345.00

COMPLETE SYSTEMS
SINGLE SIDED $365.00
DOUBLE SIDED $485.00
INCLUDES:
MINI DISK DRIVE
FUSED POWER SUPPLY
VENTED CABINET
CABLE
90 DAY WARRANTY
FACTORY ASSEMBLED
FACTORY TESTED

THESE ARE NEW 5" FD's

I2 INTERFACE, INC ↙151
20932 CANTARA ST
CANOGA PARK, CA 91304
(213) 341-7914
VISA AND MASTER CHARGE ACCEPTED

Listing 1 continued.

```
0601 :
0610 OPEN #19,0:MASTER.DAT
0620 RECNO #19=2:GOSUB 9000
0630 LET A=T:B=J
0640 GOSUB 9100::Put Julian Day Here - might need it.
0650 RECNO #19=M:GOSUB 9000::Get this month
0660 DLM=OFF
0670 LET T$=A$+" "+D$+","+" "+Y$
0680 RECNO #19=14:GOSUB 9000
0682 LET A$=T$
0684 GOSUB 9100::Put the Readable date here!
0690 DLM=ON
0699 :
0900 : END
0901 :
0990 CHAIN LEDGER.BAS
0999 :
9000 : GET    ->  MASTER.DAT
9001 :
9010 GET #19,A,B,A$
9090 RETURN
9099 :
9100 : PUT    ->  MASTER.DAT
9101 :
9110 PUT #19,A,B,A$
9190 RETURN
```

Listing 2. LEDGER.BAS program.

```
0001 : LEDGER.BAS
0002 :
0003 : Gene Embry 4/1/80
0004 :
0005 : Kilobaud Demonstration
0006 :
0009 :
0010 LET W=35
0012 DLM=OFF
0020 LINE= 0
0030 OPEN #19,0:MASTER.DAT
0032 RECNO #19=13:READ #19,A,B,H$::Name
0034 READ #19,A,B,D$::Today-Readable
0040 CLOSE #19
0050 LET L$="Minimum Accounting System"
0082 DLM=ON
0099 :
0100 : INTRO
0101 :
0110 HOME
0112 PRINT TAB(W-LEN(H$)/2);H$
0114 PRINT TAB(W-LEN(D$)/2);D$
0120 PRINT
0126 PRINT TAB(W-LEN(L$)/2);L$
0128 PRINT
0130 READ N$,P$
0132 IF N$="0" THEN 140
0134 LET T=T+1
0136 GOTO 130
0140 DIM X$(T),P$(T)
0142 RESTORE
0144 FOR X=1 TO T:READ X$(X),P$(X):NEXT X
0150 FOR X=1 TO T STEP 2
0152 IF X+1>T P.X;". ";X$(X):GOTO 160
0154 PRINT X;". ";X$(X);TAB(W+5);X+1;". ";X$(X+1)
0156 NEXT X
0160 PRINT
0162 INPUT "MAKE SELECTION ",S
0199 :
0200 : DO SOMETHING
0201 :
0210 IF S>T-1 THEN 900
0220 IF S<1 THEN 990
0230 IF X$(S)="Print Balance Sheet" P."First we must do the P&L Statement."
0290 CHAIN P$(S)
0899 :
0900 :
0910 PRINT
0920 PRINT "Bye!"
0990 END
0999 :
1000 DATA Post Transactions,TRANS.BAS
1010 DATA Post Checks Written,TRANS.BAS
1020 DATA Print Transactions,TRANS.PRT
1025 DATA Print Check Register,TRANS.PRT
1030 : DATA Access Payroll Files,MAIN.PAY
1032 : DATA Print Payroll,PAYROL.BAS
1040 : DATA Access A/R Files,MAIN.AR
1042 : DATA Access A/P Files,MAIN.AP
1050 : DATA Access Inventory Files,INVENT.BAS
1060 DATA Print Income Statement,INCOME.STM
1070 DATA Print Balance Sheet,INCOME.STM
```

More →

PERSONAL COMPUTER SYSTEMS

apple computer
Sales and Service



APPLE II, 16K, List $1195 ..... **$ 989**
32K, List $1395 ..... **$1169**
48K **1259**

ATARI® 400™, List $630
OUR PRICE ONLY $499
820 PRINTER, List $599.95 ..... **$499**
810 DISK DRIVE, List $699.95 ..... **$589**



HP-85
List $3250
ONLY $2799

- Extended BASIC Language
- Advance Graphics
- CRT Built-In Display
- Magnetic Tape Cartridge for Storage

CALCULATORS BY
HEWLETT PACKARD

HP-41C Calculator, "A System" .. **$244.95**
HP-32E Scientific w/Statistics ... **$ 53.95**
HP-33C Scientific Programmable ... **99.95**
HP-34C Advanced Scientific Programmable **123.95**
HP-37E Business Calculator **58.95**
HP-67 Handheld Fully Advanced Programmable Scientific for Business & Engineering **298.95**
HP-97 Desktop w/Built-in Printer .. **579.95**

COMMODORE PET ..... Call for Prices

Prices do not include shipping by UPS. All prices and offers are subject to change without notice.

Personal Computer Systems

✓303

609 Butternut Street
Syracuse, N.Y. 13208
(315) 478-6800

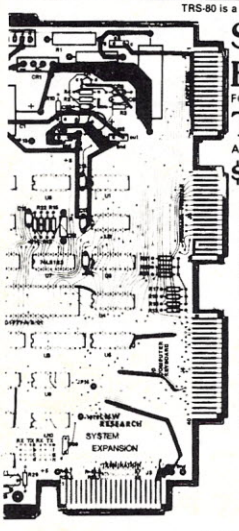
OSI 48 PIN BUSS COMPATIBLE

96 PROTOTYPE BOARD $33 Holds 96 14 or 16 pin IC's Also accommodates 18,24 or 40 pin IC's
BP-580 BACKPLANE $43 Assembled 8-slot backplane with Molex connectors and resistors.
IO-CA6 RS-232 SERIAL PORT $125 Serial I/O port Dip Switch baud rate selection.
IO-CA9 CENTRONICS PARALLEL PORT $175 Parallel printer interface with 10 ft. flat cable.
IO-CA6/9 COMBINATION $215
IO-1515 MULTI TERMINAL I/O $310 4 RS-232 I/O Ports, Dip Switch baud rate selection 4K Block of 2 MHz memory at D000 Ideal for use in multi-terminal time shared system.
CPU-1505 6502 MICROPROCESSOR $320 6502 CPU board with floppy disk controller, RS-232 serial terminal port & real time clock. Ideal for experimenters or use in OEM time shared systems. Compatible with OSI software.
MEM-CM9 24K MEMORY $435 2MHz. static low power. Dip switch address (8K &16K blocks) and memory partition selection. 1.6 Amp. at +5 V DC.
MEM-CM9F $595 As above but adds floppy disk controller and real time clock. 5 or 8 in. drives. Ideal for OSI C4 or C8 upgrades.
MEM-KIT 24K $325 Bare card, 48 2114 300 ns. low power chips & connectors. You supply "7400" series logic chips.
MEM-48 48K STATIC 2MHz. $1149 48K ultra low power 2MHz. static memory. Designed for use with 6502 CPU. DIP SWITCH memory partition address. Power ONLY 3/4 Amp at +5 V DC.

✓293

D&N MICRO PRODUCTS, INC.
3932 OAKHURST DR. FORT WAYNE, IND. 46815
(219) 485-6414
TERMS: Check or money order. Add $2 shipping and handling. Indiana residents add 4% sales tax.
DEALER INQUIRIES INVITED

TRS-80 is a registered trademark of TANDY CORP.



SYSTEM EXPANSION FOR THE TRS-80™
AT
$69.95 [PC BOARD & USER MANUAL]

- SERIAL RS232C/20 mA I/O
- FLOPPY CONTROLLER
- 32K BYTES MEMORY
- PARALLEL PRINTER PORT
- DUAL CASSETTE PORT
- REAL-TIME CLOCK
- SCREEN PRINTER BUS
- ONBOARD POWER SUPPLY
- SOFTWARE COMPATIBLE
- SOLDER MASK,SILK SCREEN

✓198

LNW RESEARCH
8 Hollowglen St. Irvine CA
714-552-8946 92714

TO ORDER
P.O. Box 16216 Irvine CA 92713
Add $3 for postage and handling.
CA residents add 6% sales tax
Master Charge & VISA orders now accepted

16K UPGRADE

$49.95

TRS80 — KEYBOARD	**TRS80 — EXP. INTERFACE**
APPLE II	**SORCERER**
ATARI 800	**HEATH 89**

FACTORY FRESH 200 ns 16K RAMS FOR MEMORY UPGRADE. KIT INCLUDES FULL INSTRUCTIONS AND COMPONENTS TO ALLOW EASY 16K CONVERSION IN MINUTES. WHY PAY DOUBLE FOR THE SAME PARTS THE MANUFACTURERS USE?

ALL PARTS CARRY A FULL 12 MONTH WARRANTY. ADD $2.00 POST AND PACKAGING; TEXAS RESIDENTS ADD 5% SALES TAX. CHECK OR MONEY ORDER ACCEPTED.

IAN ELECTRONICS ✓209
P.O. BOX 14079
AUSTIN, TEXAS 78761

Listing 2 continued.

```
1072 DATA Access COA file,CHART.COR
1080 DATA Terminate,0
1090 DATA 0,0
```

Listing 3. INCOME.STM program.

```
0001 : INCOME.STM
0002 :
0003 : Embry  3/1/80
0004 :
0005 : kb article
0006 :
0007 : Corporation
0008 :
0010 HOME
0012 PRINT "Income Statement"
0020 GOSUB 9800::Get program variables
0030 INPUT "Is this the end of the period (Y/N)  ",T$
0032 IF T$<>"Y" IF T$<>"N" THEN 30
0034 IF T$="N" THEN B1=0::Not end of month
0036 IF T$="Y" THEN B1=1::end of month
0038 GOSUB 8200::Save flag
0050 INPUT "Which port for output  ",Q
0060 PRINT "GETTING DATA"
0080 GOSUB 1000::Get ready
0099 :
0200 : PRINT HEADING
0201 :
0205 IF Q=1 THEN HOME
0210 LET H$="**":GOSUB 9100
0212 PRINT #Q,TAB(W-LEN(N$)/2);N$:P.#Q
0214 IF T$<>"Y" P.#Q,J$
0216 PRINT #Q,TAB(W-LEN(E$)/2);E$
0217 PRINT #Q
0218 PRINT #Q,TAB(W-LEN(D$)/2);D$
0220 SKIP #Q,2
0222 LET H$="- ":GOSUB 9100
0230 PRINT #Q,TAB(W1);F$;
0232 PRINT #Q,TAB(W2);F$;TAB(W3);G$;
0234 PRINT #Q,TAB(W4);G$
0240 PRINT #Q,TAB(W1);I$;TAB(W2);K$;
0242 PRINT #Q,TAB(W3);I$;TAB(W4);K$
0280 GOSUB 9100
0299 :
0300 : WORK AREA
0301 :
0310 DIGITS= 2:RJUST=5
0320 FOR Z=1 TO 5
0330 PRINT #Q
0340 ON Z GOSUB 2000,2100,3000,4000,5000
0350 PRINT #Q
0360 NEXT Z
0399 :
0400 : ENDING
0401 :
0410 SKIP #Q,2
0420 PRINT #Q,"NET PROFIT (LOSS)";
0425 LET Z=T0+T3-T1-T2-T4
0427 LET Z0=T5+T8-T6-T7-T9
0430 PRINT #Q,TAB(W1);Z;
0432 LET N3=T0:F=Z:W9=W2:GOSUB 9200
0436 PRINT #Q,TAB(W3);Z0;
0438 LET N3=T5:F=Z0:W9=W4:GOSUB 9200
0440 PRINT #Q
0490 LET H$="**":GOSUB 9100
0499 :
0500 : CLOSING
0501 :
0580 IF Q=1 THEN 800
0590 SKIP #Q,15
0599 :
0800 : Ending Procedure
0801 :
0810 DIGITS= 0:RJUST=0
0820 RECNO #19=7:GOSUB 9020:A=Z:GOSUB 9030::PROFIT
0899 :
0900 : DONE
0901 :
0910 DLM=ON
0990 CHAIN BALANC.SHT
0999 :
1000 : GET TOTALS
1001 :
1010 FOR X=1 TO T
1020 RECNO #10=X:GOSUB 9010
1022 IF A<400 THEN 1060
1030 IF F1=0 IF INT(A)>=400 THEN Z1=X:F1=1
1048 IF A>=400 IF A<=499 THEN T0=T0+B:T5=T5+C::Sales
1049 IF A>=500 IF A<=599 THEN T1=T1+B:T6=T6+C::Cost of Mdse. Sold
1050 IF A>=600 IF A<=699 THEN T2=T2+B:T7=T7+C::Expenses
1052 IF A>=700 IF A<=799 THEN T3=T3+B:T8=T8+C::Other income
1054 IF A>=800 IF A<=899 THEN T4=T4+B:T9=T9+C::Other Expenses
```

More →

Listing 3 continued.

```
1060 NEXT X
1090 RETURN
1099 :
2000 : OPERATING INCOME  Z=1
2001 :
2010 LET L=400:U=499
2012 LET N1=T0:N2=T5
2014 LET L$="REVENUE FROM SALES"
2016 PRINT #Q,TAB(W-LEN(L$)/2);L$
2020 GOSUB 8000::FIND & PRINT ACCTS.
2040 PRINT #Q,TAB(3);"NET REVENUE FROM SALES";
2050 PRINT #Q,TAB(W1);T0;
2052 LET N3=T0:F=T0:W9=W2
2054 GOSUB 9200
2060 PRINT #Q,TAB(W3);T5;
2062 LET N3=T5:F=T5:W9=W4
2064 GOSUB 9200
2070 PRINT #Q
2090 RETURN
2099 :
2100 : COST Z=2
2101 :
2110 LET L$="COST OF SALES"
2112 PRINT #Q,TAB(W-LEN(L$)/2);L$
2120 LET L=500:U=599
2122 LET N1=T1:N2=T6
2130 GOSUB 8000
2140 PRINT #Q,TAB(3);"TOTAL "+L$;
2142 PRINT #Q,TAB(W1);T1;
2144 LET N3=T0:F=T1:W9=W2:GOSUB 9200
2146 PRINT #Q,TAB(W3);T6;
2148 LET N3=T5:F=T6:W9=W4:GOSUB 9200
2150 PRINT #Q
2152 PRINT #Q
2160 PRINT #Q,TAB(3);"********************"
2170 PRINT #Q,TAB(3);"GROSS PROFIT ON SALES";
2172 PRINT #Q,TAB(W1);T0-T1;
2174 LET N3=T0:F=T0-T1:W9=W2:GOSUB 9200
2176 PRINT #Q,TAB(W3);T5-T6;
2178 LET N3=T5:F=T5-T6:W9=W4:GOSUB 9200
2186 PRINT #Q,TAB(3);"********************"
2188 PRINT #Q
2190 RETURN
2199 :
2999 :
3000 : OPERATING EXPENSES  Z=3
3001 :
3010 LET L=600:U=699
3012 LET N1=T2:N2=T7
3020 LET L$="OPERATING EXPENSES"
3022 PRINT #Q,TAB(W-LEN(L$)/2);L$
3030 GOSUB 8000
3040 PRINT #Q,TAB(3);"TOTAL OPERATING EXPENSE";
3042 PRINT #Q,TAB(W1);T2;
3044 LET N3=T0:F=T2:W9=W2:GOSUB 9200
3046 PRINT #Q,TAB(W3);T7;
3048 LET N3=T5:F=T7:W9=W4:GOSUB 9200
3062 PRINT #Q
3064 PRINT #Q
3068 PRINT #Q,"********************"
3070 PRINT #Q,"NET OPERATING INCOME";
3072 PRINT #Q,TAB(W1);T0-T1-T2;
3074 LET N3=T0:F=T0-T1-T2:W9=W2:GOSUB 9200
3076 PRINT #Q,TAB(W3);T5-T6-T7;
3078 LET N3=T5:F=T5-T6-T7:W9=W4:GOSUB 9200
3080 PRINT #Q
3087 PRINT #Q,"********************"
3090 RETURN
3099 :
3999 :
4000 : OTHER INCOME  Z=4
4001 :
4010 LET L=700:U=799
4012 LET N1=T3:N2=T8
4020 LET L$="OTHER INCOME"
4022 PRINT #Q,TAB(W-LEN(L$)/2);L$
4030 GOSUB 8000
4060 PRINT #Q,TAB(3);"TOTAL - OTHER INCOME";
4062 PRINT #Q,TAB(W1);T3;
4064 LET N3=T0:F=T3:W9=W2:GOSUB 9200
4066 PRINT #Q,TAB(W3);T8;
4068 LET N3=T5:F=T8:W9=W4:GOSUB 9200
4090 RETURN
4099 :
5000 : OTHER EXPENSES  Z=5
5001 :
5010 LET L=800:U=899
5012 LET N1=T4:N2=T9
5020 LET L$="OTHER EXPENSES"
5022 PRINT #Q,TAB(W-LEN(L$)/2);L$
5030 GOSUB 8000
5060 PRINT #Q,TAB(3);"TOTAL - OTHER EXPENSES";
5062 PRINT #Q,TAB(W1);T4;
5064 LET N3=T0:F=T4:W9=W2:GOSUB 9200
5066 PRINT #Q,TAB(W3);T9;
5068 LET N3=T5:F=T9:W9=W4:GOSUB 9200
5090 RETURN
```

More →

MARK GORDON COMPUTERS

DIVISION OF MARK GORDON ASSOCIATES, INC.

P.O. Box 77, Charlestown, MA 02129
(617) 491-7505

✓84

SORT-80

Produced exclusively for Mark Gordon Computers by SBSG

TRS-80* disk files may be sorted and merged using SORT-80, the general purpose, machine language, sort program. Written in assembly language for the Z-80 microprocessor, it can:

—Sort files one disk in length
—Sort Direct Access, Sequential Access and Basic Sequential Access files
—Reblock and print records
—Recontrol files from disk
—Be executed from DOS
—Be inserted in the job stream
—Allow parameter specification
- input/output file specification
- input/output record size
- lower/upper record limit
- print contents of output file
- input/output file key specifiers

The minimum requirement is a 32K TRS-80* Level II computer with one disk drive or a single drive Model II computer. It will operate on 35, 40 and 77 track drives, and has been tested on TRSDOS 2,1, 2.2, 2.3, NEWDOS 2.1, 3.0 and VTOS 3.0.1. It is compatible with most machine language printer drivers. Sort time is fast: for example, a 32K file will sort in approximately 40 seconds. **$59.**

InfoBox is the easiest-to-use information manager available for the TRS-80*. It's ideal for keeping track of notes to yourself, phone numbers, birthdays, inventories, bibliographies, computer programs, music tapes, and much more. This fast assembly language program lets you enter free-format data, variable length items and lets you look up items by specifying a string of characters or words that you want to find. You can also edit and delete items. Items entered into InfoBox can be written to and read from cassette and disk files. All or selected items can be printed on a parallel or serial printer. InfoBox occupies 3K. Specify cassette or disk version. **$29.95**

DBUG + 29.95

The ultimate monitor/disassembler

Compare the features and price of **DBUG +** with other monitor/disassembler programs. It offers nine true, single-byte breakpoints, single step program execution, hex and decimal arithmetic including multiply and divide and conversions, ASCII dump that distinguishes all 256 codes, disassembly to screen and printer in full Zilog mnemonics, and register set command. It also has the usual port I/O, hex and decimal memory dump, change, move, copy and exchange memory features offered by others. Ideal for the user who wants to experiment with assembly language or to write subroutines to call from BASIC; essential for the serious programmer. Special introductory price.

master charge THE INTERBANK CARD

VISA

*TRS-80 is a Tandy Corp. Trademark

✓ Reader Service—see page 226

DISK DRIVE WOES? PRINTER INTERACTION?
MEMORY LOSS? ERRATIC OPERATION?

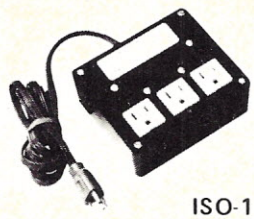
DON'T BLAME THE SOFTWARE

Power Line Spikes, Surges & Hash could be the culprit!
Floppies, printers, memory & processor often interact!
Our unique ISOLATORS eliminate equipment interaction
AND curb damaging Power Line Spikes, Surges and Hash.

Clear up Software and System problems with an ISOLATOR!

ALL ISOLATORS:
- **125 VAC, Standard 3-prong plug**
- **1875 W MAX Load - 1 KW/Socket or socket bank**
- **Balanced Pi Filtered sockets or socket banks**
- **Spike/Surge Suppression - 1000 Amps, 8/20 usec**

(SUPER ISOLATORS offer expended filtering and Spike/Surge Suppression capabilities)



ISO-1



ISO-2

ISO-1A	-3 individually filtered sockets	$ 56.95
ISO-4	-6 individually filtered sockets	96.95
ISO-2	-2 filtered banks; 6 sockets	56.95
ISO-5	-3 flitered banks; 9 sockets	79.95



IOS-6



ISO-7

***SWITCHABLE ISOLATORS - ALL ISOLATOR** advantages combined with the versatility, convenience and utility of individually switched sockets. Each switch has associated pilot lite.

ISO-6	-3 switched, filtered sockets	$128.95
ISO-8	-5 switched, filtered sockets	161.95

***SUPER ISOLATORS** - Cure for severe interference problems. Useful for Industrial applications and heavy duty controlled equipment or peripherals.

- **Dual Balanced Pi Filtered sockets**
- **Spike/Surge Suppression - 2000 Amps, 8/20 usec**

ISO-3	-3 super filtered sockets	$ 85.95
ISO-7	-5 Super-filtered sockets	139.95

***CIRCUIT BREAKER any model (add-CB) . ADD**	7.00
***CKT BKR/SWITCH/PILOT any model (CBS) ADD**	14.00

PHONE ORDERS 1-617-655-1532 ✓93

Electronic Specialists, Inc.

171 South Main Street, Natick, Mass. 01760

Dept. KB-B

Listing 3 continued.

```
5099 :
5999 :
8000 : SELECT DATA FROM FILE
8001 :
8010 FOR X=Z1 TO T
8012 RECNO #10=X:GOSUB 9010
8020 IF A<L THEN 8080
8030 IF A>U THEN Z1=X-1:GOTO 8090
8040 PRINT #Q,A$;
8042 LET F=B
8044 PRINT #Q,TAB(W1);F;
8046 LET N3=T0:W9=W2:GOSUB 9200
8048 LET F=C
8050 PRINT #Q,TAB(W3);F;
8054 LET N3=T5:W9=W4:GOSUB 9200
8070 PRINT #Q
8080 NEXT X
8090 RETURN
8099 :
8200 : END OF MONTH
8201 :
8210 RECNO #19=7
8212 GOSUB 9020::Get
8214 LET B=B1
8216 GOSUB 9030::Put
8290 RETURN
8299 :
8400 : BINARY SEARCH OF CHART.DAT
8401 :
8405 : N=ACCT # FOR SEARCH
8420 LET L=1:U=T
8430 LET I=INT((L+U)/2)
8432 SET RECNO #10=I:GOSUB 9010
8440 IF N=A THEN 8490
8450 IF N<A THEN U=I-1:GOTO 8430
8460 IF N>A THEN L=I+1:GOTO 8430
8490 RETURN
8499 :
9000 : PUT CHART.DAT
9001 :
9004 PUT #10,A,A$,B,C,D
9008 RETURN
9009 :
9010 : GET FROM CHART.DAT
9011 :
9012 GET #10,A,A$,B,C,D
9018 RETURN
9019 :
9020 : GET   -> MASTER.DAT
9021 :
9022 GET #19,A,B,A$
9028 RETURN
9029 :
9030 : PUT   -> MASTER.DAT
9031 :
9032 PUT #19,A,B,A$
9038 RETURN
9039 :
9100 : PRINT UNDERSCORE
9101 :
9110 FOR X=1 TO W
9120 PRINT #Q,H$;
9130 NEXT X
9180 PRINT #Q
9190 RETURN
9199 :
9200 : PRINT %
9201 :
9210 IF N3=0 THEN Y=0:GOTO 9240
9215 IF F=0 THEN Y=0:GOTO 9240
9220 LET Y=(F/N3)*100
9225 IF Y<-.01 THEN 9240
9230 IF Y<.01 P.#Q,TAB(W9+2);"< 0.01 ":GOTO 9290
9240 PRINT #Q,TAB(W9);Y;
9290 RETURN
9299 :
9400 : PRINT A RECORD
9401 :
9410 PRINT #Q,A$,TAB(W1);A;TAB(W3);B
9490 RETURN
9499 :
9800 : PGM VARIABLES
9801 :
9810 LINE= 0
9812 LET W=37::HALF WIDTH OF OUTPUT DEVICE
9814 LET W1=33:W2=44:W3=55:W4=66
9816 DLM=OFF
9820 OPEN #10,0:CHART.DAT
9822 OPEN #19,0:MASTER.DAT
9824 RECNO #19=14:GOSUB 9020
9826 LET D$=A$::TODAY
9830 LET E$="INCOME STATEMENT"
9832 LET F$="CURRENT"
9834 LET G$="Y-T-D"
9836 LET I$="BALANCE"
9838 LET J$="INTERIM REPORT"
```

More →

Micro Computer Industries, Ltd. ↙167

1520 EAST MULBERRY, SUITE 110
FT. COLLINS, COLO. 80524
PHONE 303-221-1955

CREATE-A-BASE

This data base management program for CBM or PET 32K handles most business data processing chores with one program. No computer experience required. Just turn it on and go!

EXTREMELY FLEXIBLE FEATURES

Create records with up to 24 fields of data of your choosing.
File up to 650 records on each floppy diskette (1800 if you own the 8050 Disk Drive).
Change or add fields at any time.
Change data disks without dumping operating program.
Sort or search by any one or two fields.
Data can be added as $ amounts, with right hand justification.
Perform arithmetic operations on fields with $ amounts (+, −, *, /).
Merge files, change or scratch records, output mailing labels.
Completely interactive with WordPro 3 or 4*, output form letters, mailing lists, accounts receivable, invoices, statements, inventories, even reports on your favorite fishing holes (and have more time to go fishing too).
Start the new year off right with Create-A-Base.
You'll pat yourself on the back for months.

Create-A-Base runs on CBM 8032 or 2001 32K machines.
Available on disk only; list price $200.00.
Price $200.00
For the 8050 Disk Drive $300.00

*Word Pro is a registered trademark of Professional Software Inc.

INVENTORY CONTROL

Disk based for CBM or PET 32K

Inventory
Point of Sale
Accounts Receivable

Inventory a minimum of 2000 items per diskette (a lot more with the 8050 Disk Drive.)

Complete records of merchandise purchased and sold.
Update files and supply cost values of stocked items.

Update cash and credit sales, write invoices, remove sales from inventory and keep running total of sales tax.
Cash sales and credit sales.

Maintain a complete record of items charged, payments on account, print bills, sort files and print out summary reports.

List price is only $100.00

WORDCHECK

WordCheck is the secretary's lifesaver!

Our newest and already one of our fastest selling programs.

This program interacts with WordPro 3 or 4*. Run your letters and documents through WordCheck it checks EVERY SINGLE WORD for spelling or typographical errors.

WordCheck contains a spelling list of most commonly used words. Any words that do not match this list will show up on your screen. If these flagged words are all right pass them by with the pressing of a single key or AUTOMATICALLY add them to the spelling list without having to retype them.

WordCheck is ideal for doctors, lawyers and anyone else doing technical writing. WordCheck is so simple to learn to use your secretary can be working with it in a matter of minutes.

Your worries are over! No more scrambling for the dictionary when you have to write "fluorescent", "nucleotide" or "receive". WordCheck does the work for you quickly, thoroughly and accurately.

Available for CBM and PET 32K** machines with dual disk drives. List price is only $200.00.

* Word Pro is a registered trademark of Professional Software Inc.
**CBM and PET are registered trademarks of Commodore Business Machines.

PET-TERM
ONLINE TERMINAL SOFTWARE FOR THE 8010 OR TNW MODEM

Machine language routines for speedy performance.

All necessary screen and keyboard character conversions.
Control key and special key functions.

Terminal to Disk Storage.
Sequential or Program file transmission capability.

Return to BASIC at will.
Operate Half or Full Duplex.

EXTRAS

Support programs, such as a
SEQ FILE READ/EDIT/PRINTER which allows you and your customers to read, edit and printout those data files you will be receiving from the SOURCE and other such data bases. Also provided is a SEQ/PROG DECODER which allows decoding of operating programs which have been transmitted via the 8010 MODEM.

This program and complete operating documentation lists for only $39.95.

↙Reader Service—see page 226

ATARI 800
16K $799*
commodore
Pet 16K $799*
EXIDY Sorcerer
16K $999*
Call or write for price list with comparable savings on a full line of peripherals and other name brands
MicroComputer Warehouse
3620 La Habra Way
Sacramento, Ca. 95825
(916) 486-3678
✓260
•Computers are fully tested and burned in for 48 hours.
*Cash price-add 2% for Visa/Mastercharge. Price subject to change without notice.

TAR HEEL SOFTWARE SYSTEMS
"Affordable Software for Small Business"
PROUDLY ANNOUNCES
REAL ESTATE BOOKKEEPING SYSTEM
a disk-based fully-integrated system including cash journal, general journal, tenant ledger, landlord ledger, monthly landlord statements, balance sheet, P & L statement by profit centers, and more, all for $150 postpaid. (North Carolina orders add 4% sales tax.) Free continuing update service included. Minimum hardware: TRS-80 Model I, 32K, 2 disk drives, line printer. Versions for TRS-80 Model II and III, Apple II and Commodore 2001 Series coming soon. Watch for announcement of other small business applications software in the months to come.
THSS
✓233
TAR HEEL SOFTWARE SYSTEMS, INC.
536 S. LEXINGTON AVE. - P.O. BOX 340
BURLINGTON, NORTH CAROLINA 27215

HOMES for the TRS-80
Featuring
High Quality, Commercial, and Economy Models.
Computer Consoles for $129.95;
Printer Stands $39.95
Complete TRS-80 Business System, built-in.

Custom furniture for the TRS-80 office or home decor.
—FOR 24 HOUR INFORMATION—
PHONE 408-946-1265
AVS AUDIO-VIDEO SYSTEMS 2485 AUTUMNVALE AVE. SAN JOSE, CA. 95132
Dealer inquiries invited.
✓192

Listing 3 continued.

```
9840 LET K$="PERCENT"
9842 RECNO #19=13:GOSUB9020:N$=A$::Name
9850 LET T=RSIZE #10
9890 RETURN
```

Listing 4. BALANC.SHT program.

```
0001 : BALANC.SHT
0002 :
0003 : Embry  3/1/80
0004 :
0005 : kb article
0006 :
0007 : Corporation
0009 :
0010 HOME
0020 LET W=21:LINE=0
0060 PRINT TAB(W);"AND NOW -   THE BALANCE SHEET"
0062 INPUT "Which Port for output  ",Q
0070 GOSUB 1000::GET DATA
0099 :
0100 : INTRODUCTION
0101 :
0110 DLM=OFF
0120 RECNO #19=13:GOSUB 9020:N$=A$::NAME
0130 RECNO #19=14:GOSUB 9020:D$=A$::DATE
0199 :
0200 : PRINT REPORT
0201 :
0205 DIGITS= 2:RJUST=6
0210 IF Q=1 THEN HOME
0212 PRINT #Q,TAB(37-LEN(N$)/2);N$
0214 SKIP #Q,2
0215 LET E$="BALANCE SHEET"
0216 PRINT #Q,TAB(37-LEN(E$)/2);E$
0217 PRINT #Q
0218 PRINT #Q,TAB(37-LEN(D$)/2);D$
0220 SKIP #Q,2
0230 PRINT #Q,"ASSETS"
0232 PRINT #Q
0240 PRINT #Q,TAB(W/4);"** CURRENT ASSETS **"
0250 GOSUB 2000
0260 PRINT #Q
0262 PRINT #Q,TAB(W/4);"** FIXED ASSETS **"
0280 GOSUB 3000
0282 PRINT #Q
0290 PRINT #Q,TAB(W/4);"** OTHER ASSETS **"
0300 GOSUB 4000
0320 SKIP #Q,2
0325 LET M=J+K+L:Z=M
0328 PRINT #Q,TAB(W/4);"************"
0330 PRINT #Q,TAB(W/4);"TOTAL ASSETS";TAB(3*W);M
0332 PRINT #Q,TAB(W/4);"************"
0399 :
0400 : LIABILITIES & EQUITY
0401 :
0410 SKIP #Q,2
0420 PRINT #Q,"LIABILITIES AND STOCKHOLDERS' EQUITY"
0430 SKIP #Q,2
0440 PRINT #Q,TAB(W/4);"** CURRENT LIABILITY **"
0450 GOSUB 5000
0460 PRINT #Q
0470 PRINT #Q,TAB(W/4);"** LONG TERM LIABILITIES **"
0480 GOSUB 6000
0490 SKIP #Q,2
0500 PRINT #Q,TAB(W/4);"** STOCKHOLDERS' EQUITY **"
0510 GOSUB 8000
0515 LET R=N+P+Q1
0517 SKIP #Q,2:P.#Q,TAB(W/4);
0518 PRINT #Q,"************************************"
0519 PRINT #Q,TAB(W/4);
0520 PRINT #Q,"TOTAL LIABILITY & STOCKHOLDERS' EQUITY";TAB(3*W);R
0521 PRINT #Q,TAB(W/4);
0522 PRINT #Q,"************************************"
0527 DIGITS= 0:RJUST=0
0540 IF Q$<>"Y" THEN 560
0560 IF V7=Z P.#Q,"BOOKS ARE IN BALANCE. GOOD WORK."
0570 IF V7<>Z THEN 9300::OUT OF BALANCE
0580 PRINT #Q,CHR$(12)
0599 :
0600 : ALL DONE
0601 :
0610 IF VG=0 THEN 900
0620 LET N1=310:GOSUB 1200::RETAINED EARNINGS
0630 LET C=C+Z:GOSUB 9000
0640 FOR X=T+1 TO RSIZE #10
0642 RECNO #10=X:GOSUB 9010::set
0644 LET B=0::reset 'current balance' to 0
0646 GOSUB 9000::PUT
0648 NEXT X
0699 :
```

More

Listing 4 continued.

```
0900 : DONE
0901 :
0980 DLM=ON
0990 CHAIN LEDGER.BAS
0999 :
1000 : OPEN AND GET ARRAY
1001 :
1005 PRINT "Getting Data"
1010 OPEN #19,0:MASTER.DAT
1012 OPEN #10,0:CHART.DAT
1018 LET T=RSIZE #10
1020 FOR X=1 TO T
1022 RECNO #10=X:GOSUB 9010
1024 IF A >=400 THEN T=X-1:GOTO 1030
1026 NEXT X
1030 RECNO #19=7:GOSUB 9020:V7=A:V6=B
1090 RETURN
1099 :
1200 : BINARY SEARCH OF CHART.DAT
1201 :
1210 LET L1=1:U=T
1220 LET I=INT((L1+U)/2)
1222 RECNO #10=I:GOSUB 9010::GET
1230 IF N1=A THEN 1290
1240 IF N1<A THEN U=I-1:GOTO 1220
1250 IF N1>A THEN L1=I+1:GOTO 1220
1290 RETURN
1299 :
2000 : CURRENT ASSETS  100 -> 149
2001 :
2010 FOR X=1 TO T
2012 RECNO #10=X:GOSUB 9010::Get
2020 IF A>149 THEN 2081
2022 IF F=1 THEN 2080
2030 IF A<100 THEN 2080
2040 LET J=J+C
2045 LET H=C
2050 PRINT #0,A$;TAB(2*W);H
2080 NEXT X
2081 LET Y=X-1
2082 PRINT #0,TAB(2);"TOTAL CURRENT ASSETS";TAB(2*W+10);J
2090 RETURN
2099 :
3000 : FIXED ASSETS  150 -> 179
3001 :
3010 FOR X=Y TO T
3012 RECNO #10=X:GOSUB 9010::Get
3020 IF INT(A)>179 THEN 3081
3030 IF A<150 THEN 3080
3035 LET H=C
3050 LET K=K+H
3060 PRINT #0,A$;TAB(2*W);H
3080 NEXT X
3081 LET Y=X-1
3082 PRINT #0,TAB(2);"NET FIXED ASSETS";TAB(2*W+10);K
3090 RETURN
3099 :
4000 : OTHER ASSETS  180 -> 199
4001 :
4010 FOR X=Y TO T
4012 RECNO #10=X:GOSUB 9010::Get
4020 IF A >=199 THEN 4081
4030 IF A<180 THEN 4080
4040 LET H=C
4050 LET L=L+H
4060 PRINT #0,A$;TAB(2*W);H
4080 NEXT X
4081 LET Y=X-1
4082 PRINT #0,TAB(2);"TOTAL OTHER ASSETS";TAB(2*W+10);L
4090 RETURN
4099 :
5000 : CURRENT LIABILITIES  200 -> 219
5001 :
5010 FOR X=Y TO T
5012 RECNO #10=X:GOSUB 9010::Get
5020 IF A >219 THEN 5081
5030 IF A<200 THEN 5080
5040 LET H=C
5050 LET N=N+H
5060 PRINT #0,A$;TAB(2*W);H
5080 NEXT X
5081 LET Y=X-1
5082 PRINT #0,TAB(2);"TOTAL CURRENT LIABILITIES";TAB(2*W+10);N
5084 LET Z=Z-N
5090 RETURN
5099 :
6000 : LONG TERM LIABILITIES  220 ->299
6001 :
6010 FOR X=Y TO T
6012 RECNO #10=X:GOSUB 9010::Get
6020 IF A >299 THEN 6081
6030 IF A<220 THEN 6080
6040 LET H=C
6060 LET P=P+H
6070 PRINT #0,A$;TAB(2*W);H
6080 NEXT X
6081 LET Y=X-1
```

More

Announcing the most important utility ever introduced for the TRS-80* Model I and Model II—

TM

ENHBAS

ENHBAS is an Enhanced Basic extension module, which loads at the top of BASIC, adding many commands and background tasks—

☐Over **30** new commands added to your BASIC:

- **SORT**-Multi-keying, multi-tagging array sort. Sorts thousands of items in mere seconds, all with *one* command!
- **JNAME**-Use line *labels* along with line numbers in branching statements, as in assembly language, using the ENHBAS commands **GTO** and **CSUB** (special GOTO and GOSUB).
  How many times have you wanted to use variables to reference line numbers? Now you can! GTO and CSUB allow variable expressions as operands, such as in **GTO X+40**.
- **WHILE / WEND**-New, structured programming loop construct. Makes for more logical program flow (less GOTO's).
- **EXEC / EVAL**-Two new, extremely powerful functions! **EVAL** evaluates an algebraic expression in string form. With EVAL you can manipulate complex functions in string form, and then evaluate them. **EXEC** executes a string expression *as if it were a BASIC program line!* With EXEC, your computer can actually write its *own* programs and execute them!
- **CALL**-Pass control to machine language subroutines at *any* address, passing parameters *both* ways.
- **CLM / PAGE**-Set up automatic page roll-over and other line printer functions from BASIC.
- ***All these and many more!***

☐In addition to the above commands, Model I ENHBAS contains *vector graphics* and drawing commands. Model II ENHBAS has many functions suited to business programming—ISAM file handling commands, RS-232 access, and many more; along with several Model I BASIC commands left out of Model II (PEEK, POKE, OUT, etc.).

☐ENHBAS includes many background utilities (Model I version):

- ***User-definable cursor***
- ***Key click***
- ***Two-tone beep on error***
- ***Automatic lower-case***
- ***Automatic debounce***
- ***Short-entry commands (Shift-letter prints command)***
- ***Real Control keys***
- ***One letter commands***
- ***Formatted LISTings***

ENHBAS is available for:

16K Model I—Level-II Tape **$39.95**
32K Model I Disk **$39.95**
32K Model III *(avail. 11/1/80)* **$39.95**
32K Model II (on TRSDOS disk) **$99.95**

*TRS-80 is a reg. trademark of Radio Shack, a Tandy Co.

Other software:

CSG PILOT-Disk-based, high level language.
32K Model I Disk **$59.95**
Z-EMULATOR-Executes assem. lang. lines.
16K Model I—Level-II Tape **$29.95**
32K Model I Disk **$29.95**
ENHCOMP-Integer subset BASIC compiler. Full graphics. Requires RS Editor/Assembler.
32K Model I Disk **$24.95**
ABBREV-Level-I abbrev. in Level-II/Disk.
16K Model I—Level-II Tape **$24.95**
32K Model I Disk **$24.95**

Dealer and OEM inquiries invited.

The Comsoft Group
6008 N.Keystone Ave., Dept. K
Indianapolis, IN 46220
(317) 257-3227
✓176

✓ Reader Service—see page 226

MEMORY IC BONANZA

INTEL 5V ONLY 16K DYNAMIC RAM: 150ns, ceramic, low power (11mw stby, 150mw oper) version of popular 16Kx1 4116. TTL compatible inputs, tri-state outputs. Equivalent to Motorola 4516, National 5295 etc. OEM list price in quantities of 1000 is $17, our price, Intel D2118-7s at ..... **$10 ea.**

INTERSIL 4K DYNAMIC RAM: Equivalent to Mostek 4096, 300ns, 4Kx1, ceramic & gold, TTL compatible inputs, tri-state outputs, low power (24mw stby, 380mw oper), priced at less than ½ the usual hobby price, sold in sleeves of 24, $30 per sleeve, that's Intersil 7005-12s at ..... **$1.25 ea.**

INTEL 2716 EPROMS - 5V ONLY: Ceramic, 450ns, the industry standard 2Kx8 EPROM. Sold by others from $27 to $59, quantity limited ..... **$20 ea.**

FULL SPEC SHEETS: Free with order or $1.00 per set of 3 for evaluation.

TERMS: Prices include insured UPS 48 states. UPS COD add $2. MC/VISA add 4%. Prime parts, new in original sleeves, guaranteed to mfr's specs. $20 minimum order. N.J. add sales tax. Immediate shipment or immediate refund.

ELECTRAVALUE INDUSTRIAL
P.O. BOX 157-K
MORRIS PLAINS, NJ 07950

Phone orders are welcome.
201/267-1117

TRS-80 Model I and Model II Programs

MULTIPLE REGRESSION 2.1—A disk based package of chained programs that permits model estimation using thousands of observations, user specified transformations, X-Y plots, formatted for screen or printer $45.00
Linear Programming..... $39.95
0-1 Programming..... $39.95
Transportation Algorithm..... $39.95
Heuristic Line Balancing..... $39.95
Stat. Pack—medium, mode, mean (avg., harmonic, geometric), variance, histograms, Tests (T,X²,F,) one variable regression, one and two-way ANOVA. $24.95
Differential equations—6 methods..... $39.95
Queuing Statistics..... $18.95
LOWERCASE MOD—Includes excellent documentation + all parts (nothing else to buy), compatible with Electric Pencil..... $14.95

Available in Disk add $5
S.C. residents add 4% sales tax
Overseas orders add $5 for shipping

137
Quant Systems
p.o. box 628
charleston sc
29402

ATARI® OWNERS

SCREEN PRINT INTERFACE

Obtain hardcopy of any screen image (graphics and / or text) on either a TRENDCOM 200 or IDS 440 Paper Tiger printer. Simply attach the supplied parallel printer cable and load the software from cassette (may be transferred to Disk). Obtain a "picture" of the screen on your printer under direct (CTRL?) or program (XIO) control. Works in all graphics / text modes as well as LPRINT and LIST "P:"

Only **$139**

Parallel Printer Interface for the ATARI 400 / 800

Connects to controller jacks 3&4 works with BASIC / DOS / ASSEMBLER **Three printer connectors available:**

	ATARI 400 / 800	
TRENDCOM 100 / 200	A4P-1	A8P-1
CENTRONICS 730 / 737	A4P-2	A8P-2
CENTRONICS 36 PIN*	A4P-3	A8P-3

CA sales add 6% tax
MC / VISA accepted.

$69.95

*Fits all other parallel Centronics plus Anadex, Base 2, Epson, Comprint and Microtek. Order by part number. ATARI is a recognized trademark of ATARI, Inc.

MACROTRONICS, inc.® 207
1125 N. Golden State Blvd. / Suite G
Turlock, CA 95380 (K) (209) 667-2888 / 634-8888

Listing 4 continued.

```
6082 PRINT #Q,TAB(2);"TOTAL LONG TERM LIABILITIES";TAB(2*W+10);P
6084 LET Z=Z-P::NET PROFIT
6090 RETURN
6099 :
8000 : EQUITY  300 ->399
8001 :
8010 FOR X=Y+1 TO T
8012 RECNO #10=X:GOSUB 9010::Get
8020 IF A >398 THEN 8072
8040 LET H=C
8050 LET Q1=Q1+H
8052 LET Z=Z-H
8060 PRINT #Q,A$;TAB(2*W);H
8070 NEXT X
8072 IF Z>=0 P.#Q,"NET PROFIT";
8074 IF Z<0 P.#Q,"NET LOSS";
8076 PRINT #Q,TAB(2*W);Z
8082 LET Q1=Q1+Z
8084 PRINT #Q,TAB(2);"TOTAL STOCKHOLDERS' EQUITY";TAB(2*W+10);Q1
8090 RETURN
8099 :
9000 : PUT CHART.DAT
9001 :
9004 PUT #10,A,A$,B,C,D
9008 RETURN
9009 :
9010 : GET CHART.DAT
9011 :
9012 GET #10,A,A$,B,C,D
9018 RETURN
9019 :
9020 : GET   -> MASTER.DAT
9021 :
9022 GET #19,A,B,A$
9028 RETURN
9029 :
9030 : PUT   -> MASTER.DAT
9031 :
9032 PUT #19,A,B,A$
9038 RETURN
9039 :
9300 : BOOKS ARE OUT OF BALANCE
9301 :
9305 DIGITS= 2:RJUST=6:IF Q=1 THEN HOME
9310 PRINT #Q,"THERE IS AN ERROR IN THE BOOKS.":P.#Q
9320 PRINT #Q,"INCOME STATEMENT - PROFIT";TAB(2*W);"$ ";V7
9322 PRINT #Q,"BALANCE SHEET  -  PROFIT";TAB(2*W);"$ ";Z
9324 PRINT #Q
9326 PRINT #Q,TAB(W);"DIFFERENCE = ";TAB(2*W);"$ ";ABS(V7-Z)
9328 PRINT #Q
9330 PRINT #Q,"YOU MUST FIND THE ERROR BEFORE RUNNING THIS AGAIN."
9340 PRINT #Q,"LET'S GO FIND THE ERROR!"
9345 IF Q<>1 THEN SKIP #Q,15
9390 DIGITS= 0:RJUST=0
9395 CHAIN CHART.COR
```

Listing 5. TRANS.BAS program.

```
0001 : TRANS.BAS
0002 :
0003 : Embry  3/1/80
0004 :
0005 : kb article
0006 :
0007 : Corporation
0009 :
0010 LINE= 0:W=25
0020 HOME
0024 PRINT "Posting of Transactions - Getting Data"
0030 GOSUB 9800::Psm. Variables
0099 :
0100 : INITIALIZE
0101 :
0105 HOME
0110 PRINT TAB(W/2);"POSTING OF CHECKS & TRANSACTIONS"
0112 PRINT
0120 IF F1<>0 GOSUB 8900:GOTO 900
0140 PRINT "Transactions now on file = ";V0
0145 PRINT "Room for ";RSIZE #11-V0;"more."
0199 :
0200 : Menu
0201 :
0210 PRINT
0220 PRINT "1. Post an Intra-Chart Transaction"
0222 PRINT "2. Post a check"
0224 PRINT "3. Return to LEDGER control"
0226 PRINT
0250 INPUT "Make selection  ",S
0252 IF S>2 THEN 900
0260 ON S GOSUB 300,1000
0290 GOTO 100
```

More

NEW PRICES...
NEW SOFTWARE for

OHIO SCIENTIFIC

(Prices effective Dec. 1, 1980)

WP6502 Word Processor Version 1.2

Cassette (all systems)	$ 50
5 Inch diskette (all systems)	$100
8 Inch disk for OS65D Systems	$100
8 Inch disk for OS65U Systems	$100
Programmed Instruction Training Course	$ 25

Version 1.2 Enhancements

DQ Mail (DMS Interface)	$ 75
DQ Duplicator (5" single drive copier)	$ 30
DQ Duplicator for 8"	$ 30
DQ Justify (TTY & Diablo Logic) Diablo/Qume & all NEC Spinwriters	
65D	$ 50
65U	$ 50
DQ Justify (TTY & Proportional Spacing) Parallel NEC Spinwriters & Centronics 737	
65D	$ 50
65U	$ 50
DQ Secretary. Dwo's enhanced 65D	$ 50
DQ Secretary. Dwo's enhanced 65U for single user, timesharing and networking systems	$250

WP6502 Word Processor Version 1.3 (January 1, 1980)

65D	$250
65U	$250
Multi-User & Networking	$500
Programmed Instruction Training Course	$ 25
Descriptive Brochure for all products	**FREE**



Dwo Quong Fok Lok Sow
23 East 20th Street
New York City, N.Y. 10003 ✓87
(212) 673-6310

COMPUTER EQUIPMENT & SOFTWARE BARGAINS



EVERY MONTH

BUY, SELL OR TRADE ALL TYPES OF COMPUTER EQUIPMENT AND SOFTWARE (pre-owned and new) among 20,000 readers nationwide.

FEATURES:

- Low classified ad rates - 10¢ a word
- Hundreds of ads from individuals
- Categorized ads so you can find them instantly
- Large (11 by 14") easy to read pages

Subscribe now for $10 and receive 13 issues/year (one FREE plus 12 regular issues). After receiving your first issue if you're not completely satisfied you may have a 100% refund and you still keep the first issue free. Bank cards accepted.

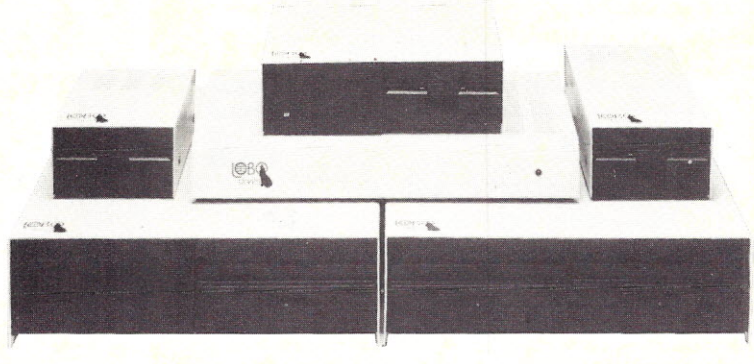
BONUS: *If you have something to advertise (pre-owned or software) send in a classified ad with your subscription and we'll run it FREE.*

✓36

The Nationwide Marketplace for Computer Equipment
COMPUTER SHOPPER
P.O. BOX F 21 • TITUSVILLE, FL 32780 • 305-269-3211

MasterCharge or VISA orders only, call **TOLL FREE 800-327-9920.**

Add-On Disk Drive Subsystems For Apple, TRS-80, S-100 Based Computers



Expansion and **enhanced capabilities** are key words in achieving full utilization of your computer system. Our complete line of LOBO disk drive subsystems are the ideal, cost-effective way to provide the expansion capabilities you need to meet your system growth requirements.

All of our subsystems are complete, thoroughly-tested, 100% burned-in, and feature a 1 year 100% parts/labor warranty.

APPLE

3101	Minifloppy, 3101I Minifloppy w/interface card
8101CA	One SA800 in cabinet w/power, DDC* Controller, cable and manual
8202CA	Two SA800 in cabinet w/power, DDC* Controller, cable and manual
5101CA	One SA850 in cabinet w/power, DDC* Controller, cable and manual
5202CA	Two SA850 in cabinet w/power, DDC* Controller, cable and manual

*Double Density Controller

S-100 BASED COMPUTERS

MODEL NO.	DESCRIPTION
4101C	SA400 in cabinet w/power
8212C	Two SA801 in cabinet w/power
5212C	Two SA851 in cabinet w/power

GENERAL

MODEL NO.	DESCRIPTION
8212	Two SA801 in cabinet
8212C	Two SA801 in cabinet w/power
5212	Two SA851 in cabinet
5212C	Two SA851 in cabinet w/power

TRS80

MODEL NO.	DESCRIPTION	MODEL NO.	DESCRIPTION
4101C	SA400 in cabinet w/power	C808	Cable for TRS80 Eight-inch Floppy
8101C II	One SA800 in cabinet w/power for Mod. II	LX80	Double-density expansion interface
8202C II	Two SA800 in cabinet w/power for Mod. II	RS232	Dual Serial Port Option
C802	Cable for Mod. II	16K	16K Byte RAM for LX80 (32KB max.)
C805	Cable for TRS80 Minifloppy	VTOS	4.0 Disk Operating System

JR ✓126
INVENTORY CO.,
P.O. Box 185, Santa Ynez, Ca., 93460
(805) 688-8781

MARK GORDON COMPUTERS

DIVISION OF MARK GORDON ASSOCIATES, INC.

P.O. Box 77, Charlestown, MA 02129

✓239 (617) 491-7505

COMPUTERS

Atari 800 W16K	799.00
Level-II 16K System	659.00
Model-II 64K System	3499.00
16K Model III	859.00

DISK DRIVES

40 Track 5¼ inch drive	314.00
80 Track 5¼	544.00
4 Disk Drive Cable	39.00

PRINTERS

Centronics 730	599.00
Epson MX80B	499.00
Centronics 737	849.00
Okidata Microline 83	1044.00
Integral Data 440G	999.00
NEC 5510 w-tractor	2679.00
Okidata Microline 80	599.00
Diablo 630	2495.00

MISC HARDWARE

Expansion int. TRS-80(Ok)	249.00
Novation Cat modem	159.00
16K Memory Kit	41.99
Leedex Monitor	109.00
Printer Cable for above	49.00
ISO-2 Isolator	54.00
AC LINE FILTER	24.00

STORAGE MEDIA

Verbatim-box 10-5¼	25.00
Memorex-box 10-5¼	22.00
Plastic Storage Box	5.00

OPERATING SYSTEMS

NEWDOS by APPARAT INC.	49.00
NEWDOS + by APPARAT INC.	99.00
MMS FORTH DISKETTE-PRIMER	79.95
NEWDOS 80	149.00

DISKETTE TRS-80*
BUSINESS SOFTWARE BY SBSG

Free enhancements and upgrades to registered owners for the cost of media and mailing. 30 day free telephone support. User reference on request.

Fully Interactive Accounting Package. General Ledger. Accounts Payable. Accounts Receivable and Payroll. Report Generating.

Complete Package (requires 3 or 4 drives)	$475.00
Individual Modules (requires 2 or 3 drives)	$125.00
Inventory II: (requires 2 or 3 drives)	$ 99.00
Mailing List Name & Address II (requires 2 drives)	$129.00
Intelligent Terminal System ST-80 III:	$150.00
The Electric Pencil from Michael Shrayer	$150.00
File Management System:	$ 49.00

FINE PRINT

TRS-80 is a Tandy Corporation trademark. Use of above operating systems may require the use of Radio Shack TRS-DOS. Radio Shack equipment subject to the will and whim of Radio Shack.

ORDERING INFORMATION

We accept Visa and Mastercharge. We will ship C.O.D. certified check or money orders only. Massachusetts residents add 5 percent sales tax.

To order call toll-free 1-800-343-5206

For information call 617-491-7505

The Company cannot be liable for pictorial or typographical inaccuracies.

Listing 5 continued.

```
0299 :
0300 : Input a Transaction
0301 :
0305 LET E1=0
0310 GOSUB 2000::set input
0312 IF F1<>0 THEN P.:GOTO 380
0320 GOSUB 4000::VERIFY
0322 IF Q$="y" THEN Q$="Y"
0324 IF Q$<>"Y" PRINT CHR$(7);"DATA NOT SAVED!":GOTO 370
0330 GOSUB 8100::Add
0332 IF F1<>0 GOSUB 8900:GOTO 370
0340 GOSUB 400::Pointers
0370 PRINT
0380 INPUT "Post another intra-chart transaction (Y/N) ",Q$
0382 IF Q$="y" THEN Q$="Y"
0384 IF Q$="Y" THEN 300
0390 RETURN
0399 :
0400 : Take care of pointers
0401 :
0420 RECNO #19=6:GOSUB 9030::GET
0430 LET B=B+1
0440 GOSUB 9040::PUT
0490 RETURN
0499 :
0899 :
0900 : Closing
0901 :
0990 CHAIN LEDGER.BAS
0999 :
1000 : Input a check
1001 :
1010 GOSUB 2000
1012 IF F1<>0 THEN 1080
1020 GOSUB 4000::VERIFY
1022 IF Q$="y" THEN Q$="Y"
1024 IF Q$<>"Y" PRINT CHR$(7);"DATA NOT SAVED!":GOTO 1080
1030 GOSUB 8100::ADD
1032 IF F1<>0 GOSUB 8900:GOTO 1080
1040 GOSUB 400::POINTERS
1080 PRINT
1082 INPUT "Want to post another check (Y/N) ",Q$
1084 IF Q$="y" THEN Q$="Y"
1086 IF Q$="Y" THEN 1000
1090 RETURN
1099 :
2000 : INPUT TRANSACTIONS & CHECKS
2001 :
2010 HOME
2011 IF S=2 P."Posting of Checks":P.
2012 IF S=2 THEN A1=100:GOTO 2022
2020 PRINT T$(1);TAB(W);:INPUT A1
2021 IF A1<100 P."ILLEGAL ACCOUNT.":GOTO 2020
2022 LET N=A1:GOSUB 3000
2024 IF F1<>0 GOSUB 8900:GOTO 2090
2026 LET I1=I::THE SLOT IN CHART.DAT FOR A1
2030 PRINT T$(2);TAB(W);:INPUT B1
2031 IF B1<100 P."ILLEGAL ACOUNT.":GOTO 2030
2032 LET N=B1:GOSUB 3000
2034 IF F1<>0 GOSUB 8900:GOTO 2090
2036 LET I2=I::THE SLOT IN CHART.DAT FOR B1
2040 PRINT T$(3);TAB(W);:INPUT E$
2050 PRINT T$(4);TAB(W);:GOSUB 2100::DATE
2060 PRINT T$(5);TAB(W);:INPUT D1
2070 IF S=2 P.T$(6);TAB(W);:INPUT E1
2090 RETURN
2099 :
2100 : INPUT DATE
2101 :
2105 PRINT
2110 INPUT "MONTH ",M
2112 IF M<1 THEN 2110
2114 IF M>12 THEN 2110
2116 LET M$=STR$(M)
2118 IF LEN(M$)<2 THEN M$="0"+STR$(M)
2120 INPUT "DAY ",D
2122 IF D<1 THEN 2120
2124 IF D>31 THEN 2120
2126 LET D$=STR$(D)
2128 IF LEN(D$)<2 THEN D$="0"+D$
2130 INPUT "YEAR ",Y
2132 IF Y<0 THEN 2130
2134 IF Y<100 THEN Y=Y+1900
2136 LET Y$=STR$(Y)
2138 IF LEN(Y$)<>4 THEN 2130
2140 LET T$=Y$+M$+D$
2150 LET C1=VAL(T$)
2190 RETURN
2199 :
3000 : BINARY SEARCH OF CHART.DAT
3001 :
3005 : N IS ACCT # FOR SEARCH
3006 :
3010 LET F1=0::ASSUME A SUCCESSFUL SEARCH
3012 IF N=399 THEN F1=3:GOTO 3090::NET PROFIT
3020 LET L=1:U=T
```

More →

Listing 5 continued.

```
3030 LET I=INT((L+U)/2)
3040 IF I=0 THEN F1=1:GOTO 3090
3050 IF L>U THEN F1=1:GOTO 3090
3052 RECNO #10=I:GOSUB 9000::GET
3060 IF N<A THEN U=I-1:GOTO 3030
3070 IF N>A THEN L=I+1:GOTO 3030
3090 RETURN
3099 :
4000 : VERIFY INPUT
4001 :
4010 HOME
4020 PRINT "VERIFY":P.
4030 FOR X=1 TO 6
4032 IF S=1 IF X=6 THEN 4072
4034 PRINT T$(X);TAB(W);
4040 IF X=1 P.A1
4045 IF X=2 P.B1
4055 IF X=3 P.E$
4060 IF X=4 P.C1
4062 IF X=5 DIGITS=2:P.D1:DIGITS=0
4064 IF X=6 IF S=2 P.E1
4070 NEXT X
4072 PRINT
4080 INPUT "DATA ENTRY O.K.  (Y/N) ",Q$
4090 RETURN
4999 :
5000 : UPDATE C.O.A.
5001 :
5010 LET X$=LEFT$(STR$(A1),1)
5012 LET Y$=LEFT$(STR$(B1),1)
5014 LET X=VAL(X$)
5016 LET Y=VAL(Y$)
5020 LET N=I1
5022 IF X<=3 GOSUB 9200:GOTO 5030
5024 GOSUB 9400
5030 LET N=I2:Z=D(Y,X)
5040 IF Y<=3 IF Z<0 GOSUB 9200:GOTO 5090
5050 IF Y<=3 GOSUB 9300:GOTO 5090
5060 IF Z<0 GOSUB 9400:GOTO 5090
5070 GOSUB 9300
5090 RETURN
5099 :
8100 : ADD
8101 :
8120 LET V0=V0+1
8122 IF V0>RSIZE #11 F1=4:GOTO 8190
8124 RECNO #11=V0:GOSUB 9020::Put
8130 GOSUB 5000::UPDATE ACCOUNTS
8140 IF V0=RSIZE #11 P."TRANSACTION FILE IS NOW FULL."
8190 RETURN
8199 :
8900 : Message Center
8901 :
8905 PRINT CHR$(7)
8910 IF F1=1 P."ACCT. # ";N;" DOES NOT EXIST!"
8930 IF F1=3 P."ACCT. # 399-NET PROFIT CAN'T BE CHANGED!"
8932 IF F1=4 P."TRANSACTION FILE IS NOW FULL. RE-ORGANIZE!"
8980 WAIT 5
8990 RETURN
8999 :
9000 : GET   -> CHART.DAT
9001 :
9004 GET #10,A,A$,B,C,D
9008 RETURN
9009 :
9010 : PUT   -> CHART.DAT
9011 :
9016 PUT #10,A,A$,B,C,D
9018 RETURN
9019 :
9020 : PUT   -> TRANS.DAT
9021 :
9024 PUT #11,A1,B1,E$,C1,D1,E1
9028 RETURN
9029 :
9030 : GET   -> MASTER.DAT
9031 :
9032 GET #19,A,B,A$
9038 RETURN
9039 :
9040 : PUT  -> MASTER.DAT
9041 :
9042 PUT #19,A,B,A$
9048 RETURN
9049 :
9100 : ADD TO CHART.DAT
9101 :
9110 RECNO #10=N:GOSUB 9000
9120 LET C=C+D1
9140 GOSUB 9010
9190 RETURN
9199 :
9200 : SUB. FROM CHART.DAT
9201 :
9210 RECNO #10=N:GOSUB 9000
9220 LET C=C-D1
```

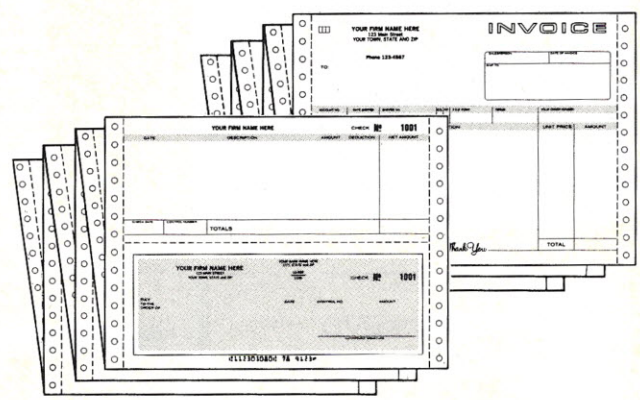
More →

FREE COMPUTER FORMS KIT

with continuous business forms for small computer systems

Each kit contains samples, programming guides, flyers, prices and order forms for checks, invoices, statements, envelopes, stock paper and labels to fit almost every computer system.

- **Available in quantities of 500, 1,000, 2,000 4,000, 6,000**
- **Low Prices (500 checks only $32.50)**



- **FAST SERVICE — It is our policy to ship within 6 working days following our receipt of your order.**
- **MONEY BACK GUARANTEE — If for any reason you are not completely satisfied, your money will be promptly refunded.**

Fast Service by mail or. . .PHONE TOLL FREE

1+800-225-9550

Mass. residents 1+800-922-8560

8:30 a.m. to 5:00 p.m. Eastern Time Monday — Friday

Please Ship FREE Kit To: **CODE 460**

Name _____

Company _____

Street _____

City, State and Zip _____

Phone _____

Computer make & model _____

Nebs Computer Forms

78 Hollis Street, Groton, Mass. 01450

A division of New England Business Service, Inc.

✓291

apple®

Disk Based System: Apple II or Apple II Plus with 48k RAM installed. Disk II with controller, RF Modulator; NEW DOS 3.3 ..... only $1799

Shipped free continental U.S.

Buy a 16k Apple II or Apple II Plus for $1195; get 32k more memory, installed, and RF modulator, FREE!

Apple Silentype® Printer $595; includes 10 rolls paper, free!

DOS 3.3 Upgrade Kit $60

Buy D.C. Hayes Micromodem II® for $379.95, get the new $95 Apple Dow Jones News and Quotes Reporter FREE!

VISA (800) 621-5802 master charge

ERICKSON COMMUNICATIONS ✓254
Chicago, IL 60630
5456 North Milwaukee Ave.
(312) 631-5181 (within Illinois)

Progressive Computing ✓202

HARDWARE: C1P VIDEO MOD. MAKES YOUR 600 VIDEO EVERY BIT AS GOOD AS THE 4P AND 8P. GIVES 32/64 CHR LINE WITH GUARDBANDS 1 AND 2 Mhz. CPU CLOCK WITH 300, 600 & 1200 BAUD FOR SERIAL PORT.
COMPLETE PLANS $19.95
KIT (HARDWARE & SOFTWARE) $39.95
INSTALLED: 32 CHR—$79.95 64 CHR—$99.95
EXTRA K OF VIDEO RAM FOR 64 CHR NOT INCLUDED!

C1P SOUND EFFECTS BOARD: COMPLETELY PROGRAMMABLE! FOR THE DISCRIMINATING HOBBYIST. THE BEST BOARD ON THE MARKET FOR CREATING SOUND AND MUSIC. CAN BE INTERRUPT DRIVEN SO THAT YOU CAN USE IT FOR GAMING PURPOSES. HAS ON BOARD AUDIO AMP 16 BIT INTERVAL TIMER, 128 BYTES OF RAM AND TWO 8 BIT PARALLEL I/O PORTS. ASSEMBLED AND TESTED $99.95 FOR C1'S AND $124.95 FOR 540 VIDEO.

BARE BOARD $39.95. BOTH INCLUDE PROG. MANUAL AND SAMPLE SOFTWARE.

C1P HI SPEED CASSETTE KIT: GIVES A RELIABLE 300, 600 & 1200 BAUD. NO SYMMETRY ADJUSTMENTS—THE IDEAL FIX FOR OSI'S CASSETTE INTERFACE. EASILY IMPLEMENTED IN 30 MIN.—WILL SAVE YOU TIME AND MONEY EVEN THE FIRST NIGHT YOU USE IT! $12.95

PROGRAMMABLE CHARACTER GENERATOR BOARD $99.95 YOU CAN USE OSI'S CHARACTERS OR YOU CAN MAKE YOUR OWN. IMAGINE YOU CAN NOW DO TRUE HIGH RESOLUTION GRAPHICS. 512 × 256 INDIVIDUAL DOTS IN THE 64 × 32 SCREEN FORMAT AND ALL UNDER YOUR CONTROL.

OTHER MODS AVAILABLE—SEND FOR CATALOG

SOFTWARE (WITH DOCUMENTATION)

PC CHESS V1.9 $14.95
PALY CHESS AGAINST YOUR COMPUTER

HELICOPTER PILOT: (64 CHR VIDEO ONLY) $8.95
AN EXCELLENT GRAPHICS PROGRAM

GOLF CHALLENGER: $14.95
FROM 1 TO 4 PLAYERS. PALY A ROUND OF GOLF ON YOUR 18 HOLE GOLF COURSE. ONE OF THE BEST PROGRAMS I HAVE EVER SEEN! YOU CAN EVEN DESIGN YOUR OWN COURSE. COMES WITH FULL DOCUMENTATION (14 PAGES).

TWO VERY INTRICATE SIMULATIONS!

WILD WEASEL II: YOU OPERATE A SAM MISSILE BASE DURING A NUCLEAR WAR. NOT AS EASY AS YOU THINK! YOU MUST OPERATE IN A THREE DIMENSIONAL ENVIRONMENT.

FAILSAFE II: THE SHOE IS ON THE OTHER FOOT! HERE YOU ARE IN THE ATTACKING BOMBER AND YOU MUST PENETRATE DEEP INTO ENEMY TERRITORY. CAN YOU SURVIVE? AN EXTREMELY COMPLEX ELECTRONIC WARFARE SIMULATION! SPECIAL—BOTH FOR $19.95

MANY MANY MORE—SEND FOR CATALOG WITH FREE PROGRAM (HARD COPY) AND BASIC MEMORY MAP. $1.00. TWO LOCATIONS TO SERVE YOU:
3336 AVONDALE CRT., WINDSOR, ONT., CANADA N9E 1X6 (519) 969-2500
3281 COUNTRYSIDE CIR., PONTIAC TWP., MI 48057 (313) 373-0468

master charge VISA

Listing 5 continued.

```
9230 GOSUB 9010
9290 RETURN
9299 :
9300 : ADD TO CHART.DAT
9301 :
9310 RECNO #10=N:GOSUB 9000
9320 LET B=B+D1:C=C+D1
9330 GOSUB 9010
9390 RETURN
9399 :
9400 : SUB. FROM CHART.DAT
9401 :
9410 RECNO #10=N:GOSUB 9000
9420 LET B=B-D1:C=C-D1
9430 GOSUB 9010
9490 RETURN
9499 :
9800 : PGM VARIABLES
9801 :
9810 OPEN #19,0:MASTER.DAT
9814 DIM D(8,8),T$(6)
9816 RECNO #19=6:GOSUB 9030:V0=B::# IN TRANS.DAT
9820 OPEN #11,0:TRANS.DAT
9830 IF V0=RSIZE #11 THEN F1=4::TRANS.DAT IS FULL
9840 OPEN #10,0:CHART.DAT
9842 LET T=RSIZE #10
9850 FOR Y=1 TO 8:FOR X=1 TO 8:READ D(Y,X):NEXT X:NEXT Y
9860 FOR X=1 TO 6:READ T$(X):NEXT X
9890 RETURN
9899 :
9900 : Array to determine what to do
9901 :
9910 DATA 1,-1,-1,-1,1,1,-1,1
9912 DATA -1,1,1,1,-1,-1,1,-1
9914 DATA -1,1,1,1,-1,-1,1,-1
9916 DATA -1,1,1,1,-1,-1,1,-1
9918 DATA 1,-1,-1,-1,1,1,-1,1
9920 DATA 1,-1,-1,-1,1,1,-1,1
9922 DATA -1,1,1,1,-1,-1,1,-1
9924 DATA 1,-1,-1,-1,1,1,-1,1
9970 DATA THE 'FROM' ACCT. #:
9974 DATA THE 'TO' ACCT. #:
9976 DATA DESCRIPTION:
9978 DATA DATE:
9980 DATA AMOUNT:
9982 DATA CHECK #:
```

Listing 6. TRANS.PRT program.

```
0001 : TRANS.PRT
0002 :
0003 : Embry   3/1/80
0004 :
0005 : kb article
0006 :
0007 : Corporation
0008 :
0009 :
0010 HOME
0020 PRINT "Transaction Print - Getting Data"
0030 GOSUB 9800::PGM VARIABLES
0040 IF V=0 P."NO TRANSACTIONS":GOTO 900
0099 :
0100 : INFORMATION
0101 :
0110 HOME
0120 PRINT "     This will print a list of all transactions"
0122 PRINT "since the data file was last cleared."
0130 PRINT
0140 INPUT "Is that what you want  (Y/N) ",Q$
0142 IF Q$="n" THEN Q$="N"
0144 IF Q$="N" THEN 900
0146 IF Q$="y" THEN Q$="Y"
0148 IF Q$<>"Y"THEN 140
0199 :
0200 : Menu
0201 :
0210 HOME
0212 PRINT "OPTIONS AVAILABLE"
0214 PRINT
0220 PRINT "1. Listing in order entered."
0226 PRINT "2. Return to Ledger control."
0228 PRINT
0230 INPUT "MAKE SELECTION ",S
0232 IF S>1 THEN 600
0240 INPUT "Which port for output  ",Q
0250 IF Q=1 THEN HOME
0260 GOSUB 300
0270 IF Q<>1 SKIP #Q,15
0290 GOTO 200
0299 :
```

More

THE FIRST TRS-80® COMPATIBLE COMPUTER WITH HIGH DENSITY COLOR GRAPHICS!



LNW RESEARCH introduces the LNW80, a high performance color computer, compatible with the TRS-80™ Model I. The fully integrated LNW80 is a sophisticated and versatile microcomputer with the following powerful features.

COMPATIBILITY

Hardware and software compatible to the Radio Shack TRS-80™ Model I computer, provides the widest software base of any microcomputer. cassette interface; expansion bus

DISPLAY

Quality upper and lower case display.

Two modes of color graphics, high resolution graphics, 384 x 192 in eight colors - higher density than the Apple II*. Low density color graphics of 128 x 192 are also available in eight colors.

High resolution - black and white graphics - of 384 x 192 mixed with text and TRS-80™ standard graphics.

Reverse video, composite video RF output.

PERFORMANCE

The LNW80 utilizes the fast Z-80A microprocessor which executes at a speed of 4 MHZ - over twice the speed of the TRS-80™ Model I.

LNW80

PC BOARD $89.95

Ask about our : Keyboard cabinet Leedex VIDEO 100-80

LNW RESEARCH ✓198

LNW RESEARCH 3183-E AIRWAY AVE COSTA MESA CA 92626 714-552-8946

*Apple II is a TM of Apple Computer, Inc. TRS-80 is a TM of Tandy Corp.

NEW **EXTERNAL DATA SEPERATOR** ASSEMBLED AND FULLY TESTED $14.95

SYSTEM EXPANSION AT $69.95 [PC BOARD & USER MANUAL]

- SERIAL RS232C/20 mA I/O
- FLOPPY CONTROLLER
- 32K BYTES MEMORY
- PARALLEL PRINTER PORT
- DUAL CASSETTE PORT
- REAL-TIME CLOCK
- SCREEN PRINTER BUS
- ONBOARD POWER SUPPLY
- SOFTWARE COMPATIBLE
- SOLDER MASK,SILK SCREEN

ORDERING INFORMATION

Add $3 for postage and handling. CA residents add 6% sales tax

VISA master charge

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes —

HARD DISK MULTIPLEXOR
FOR THE TRS-80* Mod II

NOW YOU CAN HAVE THAT LARGE COMMON DATA BASE!!

- Allows up to 4 Mod II's to connect to a single controller — up to 4 hard disk drives per controller. Users may access the same file simultaneously (first-come first-served).
- Uses Cameo controller and standard 10-megabyte cartridge (hard) disk drives along with RACET Hard/Soft Disk System (HSD) software.
- Access times 3 to 8 times faster than floppy. Mixed floppy/hard disk operation supported.
- Compatible with your existing TRSDOS programs — you need only change filenames! All BASIC statements are identical.
- A single file may be as large as one disk. Alternate mode allows 24-million byte record range. Directory expandable to handle thousands of files.
- Includes special utilities — XCOPY for backup and copies, XPURGE for multiple deletions, DCS directory catalog system, and Hard Disk Superzap. FORMAT utility includes options for specifying sectors/gran, platters/drive, logical disk size, etc.

HARD DISK DRIVE & CONTROLLER $5995 **RACET HSD Software $400**
Call for multiuser pricing. Dealers call for OEM pricing.

BASIC LINK FACILITY 'BLINK' **$25 Mod I, $50 Mod II**
Link from one BASIC program to another saving all variables! The new program can be smaller or larger than the original program in memory. The chained program may either replace the original program, or can be **merged** by statement number. The statement number where the chained program execution is to begin may be specified! (Mod I Min 32K 1-disk)

INFINITE BASIC (Mod I Tape or Disk) **$49.95**
Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

INFINITE BUSINESS (Requires Infinite BASIC) **$29.95**
Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, −, *, /. Binary search of sorted and unsorted arrays. Hash codes.

BASIC CROSS REFERENCE UTILITY (Mod II 64K) **$50.00**
SEEK and FIND functions for Variables, Line Numbers, Strings, Keywords. 'All' options available for line numbers and variables. Load from BASIC — Call with 'CTRL'R. Output to screen or printer!

DSM **$75.00 Mod I, $150.00 Mod II**
Disk Sort/Merge for RANDOM files. All machine language stand-alone package for sorting speed. Establish sort specification in simple BASIC command File. Execute from DOS. Only operator action to sort is to change diskettes when requested! Handles multiple diskette files! Super fast sort times — improved disk I/O times make this the fastest Disk Sort/Merge available on Mod I or Mod II.
(Mod I Min 32K 2-drive system. Mod II 64K 1-drive)

UTILITY PACKAGE (Mod II 64K) **$150.00**
Important enhancements to the Mod II. The file recovery capabilities alone will pay for the package in even one application! Fully documented in 124 page manual! XHIT, XGAT, XCOPY and SUPERZAP are used to reconstruct or recover date from bad diskettes! XCOPY provides multi-file copies, 'Wild-card' mask select, absolute sector mode and other features. SUPERZAP allows examine/change any sector on diskette include track-0, and absolute disk backup/copy with I/O recovery. DCS builds consolidated directories from multiple diskettes into a single display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutine calling, program looping, dynamic disassembly and more!!

DEVELOPMENT PACKAGE (Mod II 64K) **$125.00**
Includes RACET machine language SUPERZAP, Apparat Disassembler, and Model II interface to the Microsoft 'Editor Assembler Plus' software package including uploading services and patches for Disk I/O. Purchase price includes complete copy of Editor Assembler + and documentation for Mod I. Assemble directly into memory, MACRO facility, save all or portions of source to disk, dynamic debug facility (ZBUG), extended editor commands.

COMPROC (Mod I — Disk only) **$19.95**
Command Processor. Auto your disk to perform any sequence of instructions that you can give from the keyboard. DIR, FREE, pause, wait for user input, BASIC, No. of FILES and MEM SIZE, RUN program, respond to input statements, BREAK, return to DOS, etc. Includes lowercase driver, debounce, screenprint!

CHECK, VISA, M/C, C.O.D., PURCHASE ORDER
TELEPHONE ORDERS ACCEPTED (714) 637-5016

*TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORPORATION

✓101 **RACET COMPUTES**
702 Palmdale, Orange, CA 92665

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes —

✓Reader Service—see page 226

MISSPELLED WORDS?

WordSearch (tm) can find them quickly and reliably. **WordSearch** is the ideal companion for your CP/M compatible editor or word processing system. **WordSearch** completes the job that these word processing tools started.

WordSearch is a sophisticated interactive menu driven application that can be tailored to fit your system, terminal and working vocabulary. **WordSearch** allows for an unlimited vocabulary size without being constrained by language or special subset. Available user system disk storage capacity is the only consideration.

WordSearch is EASY to use. Defaults can be reset at any time as either a permanent or temporary condition thus avoiding almost all redundant or otherwise unnecessary keystrokes.

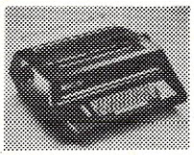
WordSearch is available now for $195.00 from

KEY bits INCORPORATED
P.O. Box 592293
Miami, Florida 33159
(305) 238-3820

MASTER CHARGE and VISA accepted.

CP/M is a registered trademark of Digital Research.
All prices are FOB Miami and subject to change without prior notice.
Copyright (C) 1980 Key Bits Inc.
All rights reserved worldwide. ✓223

DIABLO 1620 $1795



- Letter quality daisywheel printer
- Forms tractor included
- Bidirectional Printing

Completely refurbished by national terminal distributor with 30 day warranty. All units have serial interface, keyboard, ASCII, upper and lower case.

QUME DIABLO NEC

Print Wheels	EA	6+
Diablo	8.25	7.50
Qume	8.25	7.50
Nec	17.00	15.50

Ribbons	EA	Doz
Diablo	6.50	72.00
Qume	4.00	43.50
Nec	7.00	71.50

3M DISKETTES 3M

5¼" Sgl. Dens.	29.95
8" Sgl. Dens.	31.00
8" Dbl. Dens.	39.95
Library Cases	2.95

Head Cleaning Diskette Kit $23.95

DAVIS SYSTEMS, INC. ✓63
P.O. BOX 98407
ATLANTA, GA. 30359
(404) 634-2300

Listing 6 continued.

```
0300 : LISTING OF TRANSACTIONS
0301 :
0310 LET L$="Transactions by ORDER ENTERED"
0312 GOSUB 1100::HEADER FOR TRANSACTIONS
0320 FOR X=1 TO V
0330 RECNO #10=X:GOSUB 9000::GET
0335 GOSUB 8900::CONVERT DATE
0340 GOSUB 2100::PRINT IT
0350 NEXT X
0388 LET H$="- ":GOSUB 1800
0390 RETURN
0399 :
0600 : RE-SET TRANS.DAT ?
0601 :
0610 PRINT
0620 INPUT "Do you wish to re-set the Transaction-Check Register file (Y/N)
0622 IF Q$="n" THEN Q$="N"
0630 IF Q$="N" THEN 900
0632 IF Q$="y" THEN Q$="Y"
0640 IF Q$<>"Y" THEN 620
0670 RECNO #19=6:GOSUB 9200
0680 LET A=0:B=0:GOSUB 9300
0699 :
0900 : Done
0901 :
0920 DLM=ON
0990 CHAIN LEDGER.BAS
0999 :
1100 : HEADER FOR INTRA-CHART TRANSFERS
1101 :
1110 LET H$="- ":GOSUB 1800
1112 PRINT #Q,TAB(35-LEN(N$)/2);N$:SKIP #Q,2
1116 PRINT #Q,TAB(35-LEN(L$)/2);L$
1118 SKIP #Q,2
1119 PRINT #Q,"TODAY'S DATE:";
1120 PRINT #Q,TAB(35-LEN(O$)/2);O$:SKIP #Q,2
1122 LET H$="= ":GOSUB 1800
1130 PRINT #Q,"   DATE";
1135 PRINT #Q, TAB(T1);"ACCOUNT #";
1140 PRINT #Q,TAB(T2+5);"DESCRIPTION";
1145 PRINT #Q, TAB(T3+3);"AMOUNT";TAB(T4+6);"CK. #"
1180 LET H$="= ":GOSUB 1800
1190 RETURN
1199 :
1800 : UNDERLINE
1801 :
1810 FOR X=1 TO T4/2+7
1820 PRINT #Q,H$;
1830 NEXT X
1840 PRINT #Q
1890 RETURN
1899 :
2100 : PRINT A TRANSACTION RECORD
2101 :
2103 IF X<10 P.#Q,TAB(2);
2105 LET X$=STR$(X)+". "+F$
2110 PRINT #Q,X$;
2112 RJUST= 7
2120 PRINT #Q,TAB(T1);E;
2130 LET K=E:GOSUB 8800
2140 PRINT #Q,TAB(T2);A$;
2148 DIGITS= 2:RJUST=7
2150 PRINT #Q,TAB(T3);H;
2151 DIGITS= 0
2152 IF I=0 P.#Q:GOTO 2156
2154 PRINT #Q,TAB(T4+5);I
2156 DIGITS= 0:RJUST=0
2158 IF S=3 THEN 2190
2159 RJUST= 7
2160 PRINT #Q,TAB(T1);F;
2170 LET K=F:GOSUB 8800
2175 PRINT #Q,TAB(T2);A$
2185 PRINT #Q,"PURPOSE: ";G$
2187 PRINT #Q
2190 RETURN
2199 :
8800 : BINARY SEARCH
8801 :
8810 LET L=1:U=T
8820 LET Y=INT((L+U)/2)
8822 SET RECNO #11=Y:GOSUB 9100::GET
8830 IF K=A THEN 8890
8840 IF K<A THEN U=Y-1:GOTO 8820
8850 LET L=Y+1
8860 GOTO 8820
8890 RETURN
8899 :
8900 : CONVERT DATE
8901 :
8910 LET F$=STR$(G)
8912 LET Y$=MID$(F$,3,2)
8920 LET F$=RIGHT$(F$,4)
8930 LET M$=LEFT$(F$,2)
8932 LET M=VAL(M$):M$=STR$(M)
8940 LET D$=RIGHT$(F$,2)
8942 LET D1=VAL(D$):D$=STR$(D1)
8950 LET F$=M$+"/"+D$+"/"+Y$
```

More

Listing 6 continued.

```
8990 RETURN
8999 :
9000 : GET  ->  TRANS.DAT
9001 :
9010 GET #10,E,F,G$,G,H,I
9090 RETURN
9099 :
9100 : GET   -> CHART.DAT
9101 :
9110 GET #11,A,A$,B,C,D
9190 RETURN
9199 :
9200 : GET   ->  MASTER.DAT
9201 :
9210 GET #19,A,B,A$
9290 RETURN
9299 :
9300 : PUT   ->  MASTER.DAT
9301 :
9310 PUT #19,A,B,A$
9390 RETURN
9399 :
9800 : PGM VARIABLES
9801 :
9810 LET W=10:LINE=0:DLM=OFF
9812 OPEN #19,0:MASTER.DAT
9814 RECNO #19=6:GOSUB 9200:V=B::# IN TRANS.DAT
9817 IF V=0 THEN 9890::EMPTY
9818 RECNO #19=13:GOSUB 9200:N$=A$::NAME
9820 RECNO #19=14:GOSUB 9200:D$=A$::DATE
9822 PRINT "THERE ARE ";V;"TRANSACTIONS ON FILE."
9850 LET T1=15:T2=30:T3=55:T4=65
9880 OPEN #10,0:TRANS.DAT
9882 OPEN #11,0:CHART.DAT
9883 LET T=RSIZE #11
9890 RETURN
```

Listing 7. INIT.BAS program.

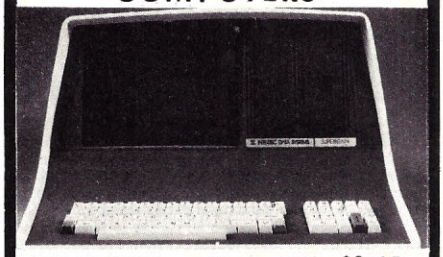
```
0001 : INIT.BAS
0002 :
0005 : Embry   3/1/80
0006 :
0007 : kb article
0009 :
0010 LINE= 0:W=43
0020 LET W1=7
0022 LET W2=20
0024 LET W3=55
0030 HOME
0032 PRINT "     This program will create the files necessary"
0034 PRINT "to run a minimum Accounting System.  The"
0036 PRINT "disk in drive #0 should contain only programs."
0038 PRINT "Three DATA files will be created.  If they now exist"
0040 PRINT "they will be DELETED!"
0042 PRINT
0044 INPUT "Do you want to continue  (Y/N)  ",Q$
0046 IF Q$<>"Y" IF Q$<>"N" PRINT CHR$(7):GOTO 44
0050 IF Q$="N" THEN END
0082 PRINT
0099 :
0100 : Count the Number of Accounts
0101 :
0110 READ N,N$
0120 IF N=0 PRINT"There are ";T;"accounts.":GOTO 150
0130 LET T=T+1
0140 GOTO 110
0150 IF T>255 PRINT"Maximum accounts is 255!  Re-orsaize.":END
0199 :
0200 : SET THE ARRAYS
0201 :
0205 RESTORE
0210 DIM C$(T),C(T,4)
0211 : C$(T) = This is the description of the Account
0212 : C(T,1) = This is the Account Number
0214 : C(T,2) = This is the Period or Current Balance
0216 : C(T,3) = This is the YTD Balance or Balance
0218 : C(T,4) = Reserved
0219 :
0220 FOR X=1 TO T
0230 READ N,N$
0240 LET C(X,1)=N:C$(X)=N$
0250 NEXT X
0299 :
0300 : Input the Balances of the accounts
0301 :
0310 INPUT "Do you want all account balances set to '0'  (Y/N)  ",Q$
0312 IF Q$="y" THEN Q$="Y"
0314 IF Q$="Y" THEN 500
0330 HOME
0340 PRINT "ACCT #      INPUT BALANCE AS REQUESTED."
```

More →

Reader Service—see page 226

Buy By Mail and Save!

COMPUTERS



INTERTEC SuperBank, 32K . **$2495**
64K Ram, List $3345 . . . . . **$2695**
64K Quad, List $3995 . . . . . $3395
NORTH STAR Horizon I
32K DD List $2695 . . . . . **$1989**
Horizon I QD List $2995 . . . . **$2245**
Horizon 2 32K DD,List $3095 **$2289**
IntersystemDP-1 List $1749 . . **$1495**



CROMENCO Z-2, List $9995 . **$7945**
System 64K, List $3990 . . . . **$3179**
System 3 64K, List $7395 . . . . **5689**
ATARI 800, List $1080 . . . . . **$799**
APPLE II, 16K **$969**

DISK SYSTEMS

THINKER TOYS Discus 2D . . **$939**
Dual Discus 2D **$1559**
Discus 2 + 2, List $1549 . . . . **$1259**
M26 Hard Disk, List $4995 . . . **$3949**

PRINTERS & TERMINALS

PAPER TIGERS IDS-440 **$679**
With graphic option **$749**
CENTRONICS 730-1,List $795 **$595**
737, List $995 . . . . . **$789**
704-9 180 cps **$1495**
703-9 180 cps **$1569**
T I 810,List $1895 . . . . . **$1489**
NEC SPINWRITER5530 **$2395**
NEC SPINWRITER 5515 **$2395**
DIABLO 630 List $2711 . . . . . **$2399**
INTERTEC
Intertube III,List $895 . . . . . **729**
Emulator **$729**
Televideo 912C. **$679**
920C **$799**
Hazeltine 1420 . . . . . **$789**
1500 . . . . . **$845**
Soroc 120, List $995 . . . . . **$689**
Soroc 140 . . . . . **$994**

Most items in stock for immediate delivery. Factory sealed cartons, w/full factory warranty. NYS residents add appropriate sales tax. Prices do not include shipping. VISA and Master Charge add 3%. C.O.D. orders require 25% deposit. Prices subject to change without notice.

227

Computers Wholesale

P.O. Box 144 Camillus, NY 13031

VISA (315) 472-2582 master charge

OSI (8K) APPLE TRS-80†



Computers & Gambling Products Magazine*

PRESENTS:

PROBABILITY HANDICAPPING DEVICE 1 — A BASIC PROGRAM FOR: HORSE RACE HANDCAPPING!

This incredible program was written by a professional software consultant to TRW Space Systems. This is a complex program carefully human factored for easy use. It is a comprehensive horse racing system for spotting overlays in thoroughbred sprint races. Your computer will accurately predict the win probability and odds line for each horse based on your entries from the racing form. The next day overlaid horses can be spotted on the track tote board. The user's manual contains a complete explanation of overlay betting plus much more useful information. The appendix contains a detailed tab run of a 100 consecutive race system workout showing **an amazing 50% return** ($1.50 returned for each $1.00 flat wager.) Includes many features such as error correction, bubble sort, line printer output, automatic keyboard debounce, archiving, etc. The manual may be ordered separately for perusal for $7.95 and credit.

CHALLENGER 1P, 2P, or 4P 8K VERSIONS Now Available!
Phd-1 User's manual and cassette for:
Apple II (16K), TRS-80 Level II (16K), Challenger (8K) ... 29.95
TRS-80 or APPLE DISK ... 34.95

BRAND NEW FROM SDL: WIN AT THE RACES. This thoroughbred handicapping algorithm is based on a currently popular book on thoroughbred multiple regression techniques. Both sprints and routes. All of the features of PHD-1 plus more. This program incorporates the best data entry technique we've ever seen.
32K TRS-80 or APPLE CASSETTE ... 34.95
32K TRS-80 or APPLE DISK ... 39.95

BOOKS:
Winning at the Races ... 21.95 + .75 P&H
Beating the Races with a Computer ... 14.95 + .75 P&H

Make checks payable to **JOE COMPUTER DEPT K ✓247**
22713 Ventura Blvd., Suite F, Woodland Hills, CA 91364
CA residents add 6 % sales tax.
PHONE ORDERS: 213-992-0514

*SEND $2.00 TO PLACE YOUR NAME ON OUR MAILING LIST.
†*TRS-80 is a registered trademark of Tandy Corporation.*

MICRO MEDIA MAGAZINE

By M-Cubed Productions, Inc.

A Floppy Disk-Based Publication Available for Heath and TRS-80™ Micro-Computers

Software, Graphics,
Reviews, Up-to-Date Information,
and much more

Bi-Monthly Issue $11.95
Annual Subscription $55.00

MC/VISA Accepted

For Information or Subscriptions

Write: ✓72
MICRO MEDIA MAGAZINE
1316 Elmhurst
Garland, Texas 75041

*TRS-80 is a trademark of Tandy Corp.

Listing 7 continued.

```
0350 FOR X=1 TO T
0352 IF C(X,1)=399 THEN 399::Net Profit Exception
0380 PRINT C(X,1);"  ";C$(X);TAB(W)::INPUT"BALANCE  ",C(X,3)
0390 NEXT X
0399 :
0500 : Save the COA
0501 :
0510 LET Y$="0:CHART.DAT"
0512 IF FCHK Y$<>5 THEN FDEL Y$
0520 CREATE #10,0:CHART.DAT,T,58
0530 PRINT "*     Saving the COA     *"
0550 FOR X=1 TO T
0560 RECNO #10=X
0562 LET A=C(X,1):B=C(X,2):C=C(X,3):D=0
0570 PUT #10,A,C$(X),B,C,D
0580 NEXT X
0590 CLOSE #10
0599 :
0600 : Form the rest of the data files
0601 :
0610 LET Y$="0:MASTER.DAT"
0612 PRINT "Creating 'MASTER.DAT' file."
0614 IF FCHK Y$<>5 THEN FDEL Y$
0616 CREATE #10,MASTER.DAT,25,45
0618 CLOSE #10
0620 PRINT "Creating 'TRANS.DAT' file."
0622 LET Y$="0:TRANS.DAT"
0624 IF FCHK Y$<>5 THEN FDEL Y$
0626 CREATE #10,Y$,50,63
0628 CLOSE #10
0699 :
0700 : Input a few items
0701 :
0710 HOME
0712 LET A=0:B=0
0714 DLM=OFF
0718 OPEN #19,0:MASTER.DAT
0720 INPUT "Name of Corporation:  ",A$
0722 RECNO #19=13:PUT #19,A,B,A$
0730 INPUT "Street Address:       ",A$
0732 RECNO #19=22:PUT #19,A,B,A$
0740 INPUT "City, State  ZIP      ",A$
0742 RECNO #19=23:PUT #19,A,B,A$
0799 :
0800 : Save the Months
0801 :
0810 READ Y$::step over the last two '0'
0820 FOR X=1 TO 12
0822 READ Y$
0824 RECNO #19=X
0826 PUT #19,A,B,Y$
0830 NEXT X
0890 CLOSE #19
0899 :
0900 : MESSAGE
0901 :
0910 HOME
0920 PRINT "     This completes the initialization of the Chart"
0922 PRINT "of Accounts.  You may re-run this program anytime by"
0924 PRINT "loading in BASIC and typing 'CHAIN INIT.BAS'."
0970 DLM=ON
0980 CHAIN BEGIN
0999 :
1000 : Current Assets
1001 :
1005 : ACCTS. 100 -> 149
1009 :
1010 DATA 100,CHECKING
1020 DATA 103,PETTY CASH
1036 DATA 106,PREPAID INSURANCE
1038 DATA 107,PREPAID INTEREST
1039 DATA 108,INSURANCE - CASH VALUE
1070 DATA 110,A/R - TRADE
1072 DATA 111,A/R - EMPLOYEES
1080 DATA 120,INVENTORY
1099 :
1999 :
2000 : Fixed Assets
2001 :
2002 : Accounts    150  -> 179
2009 :
2012 DATA 150,LAND
2014 DATA 160,DEPRECIABLE ASSETS
2016 DATA 161, LESS DEPRECIATION CLAIMED
2999 :
3000 : Other Assets
3001 :
3005 : ACCTS. 180 -> 199
3009 :
3010 DATA 180,DEFERRED INTEREST EXPENSE
3020 DATA 185,ORGANIZATIONAL EXPENSE
3999 :
4000 : Current Liabilities
4001 :
4005 : ACCTS. 200 -> 219
4009 :
4010 DATA 200,ACCOUNTS PAYABLE
```

More →

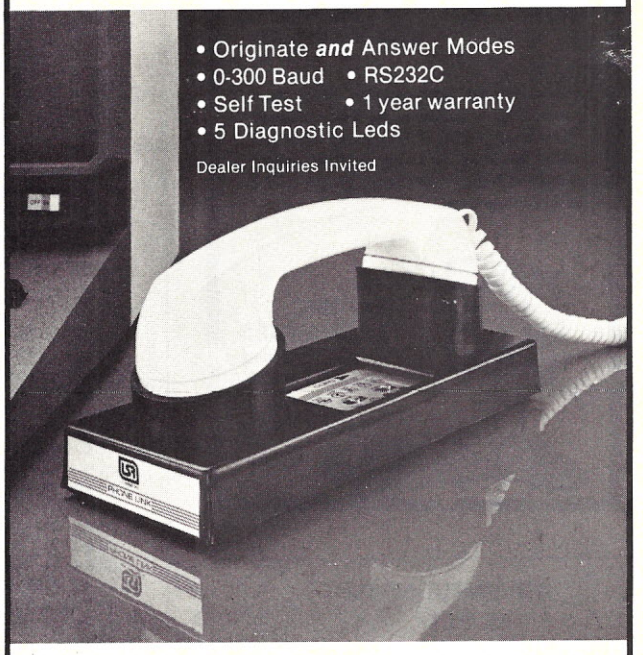
Listing 7 continued.

```
4030 DATA 205,FICA WITHHELD
4040 DATA 206,FED. TAX WITHHELD
4050 DATA 207,STATE TAX WITHHELD
4055 DATA 208,STATE - UNEMP TAX
4057 DATA 209,FED. UNEMP TAX
4090 DATA 217,INTEREST PAYABLE
4099 :
4999 :
5000 : LONG TERM LIABILITIES
5001 :
5005 : ACCTS. 220 -> 299
5009 :
5010 DATA 220,NOTE #1 PAYABLE
5020 DATA 222,NOTE #2 PAYABLE
5999 :
6000 : STOCKHOLDERS' EQUITY
6001 :
6005 : ACCTS. 300 -> 399
6009 :
6010 DATA 300,CAPITAL
6030 DATA 310,RETAINED EARNINGS
6090 DATA 399,NET PROFIT
6999 :
7000 : SALES &/OR INCOME
7001 :
7005 : ACCTS. 400 -> 499
7009 :
7010 DATA 400,CASH - SALES
7020 DATA 401,SALES - ON ACCOUNT
7499 :
7500 : INVENTORY
7501 :
7506 :
7510 DATA 500,COST OF MDSE. SOLD
7999 :
8000 : OPERATING EXPENSES
8001 :
8005 : ACCTS. 600 -> 699
8009 :
8010 DATA 600,ADVERTISING & SALES PROM.
8012 DATA 602,ACCOUNTING & AUDIT FEES
8014 DATA 604,BANK SERVICE CHARGE
8016 DATA 606,DATA PROCESSING
8020 DATA 610 DEPRECIATION
8024 DATA 614,DONATION
8026 DATA 616,DUES & SUBSCRIPTION
8028 DATA 617,FREIGHT
8032 DATA 620,INSURANCE
8036 DATA 624,INTEREST
8042 DATA 630,LEGAL
8046 DATA 634,MAINTENANCE
8049 DATA 637,INVENTORY SHORTAGE
8050 DATA 638,OFFICE SUPPLIES
8052 DATA 640,PAYROLL
8060 DATA 648,PAYROLL TAXES
8070 DATA 658,POSTAGE
8072 DATA 660,RENT
8078 DATA 666,TELEPHONE & TELEGRAPH
8080 DATA 668,TRAVEL & ENTERTAINMENT
8088 DATA 676,UTILITIES
8099 :
8499 :
8500 : OTHER INCOME
8501 :
8505 : ACCTS 700 -> 799
8509 :
8510 DATA 700,INTEREST INCOME
8520 DATA 710,RENTAL INCOME
8530 DATA 720,CASH OVER OR SHORT
8540 DATA 730,SALE OF ASSETS
8999 :
9000 : OTHER EXPENSES
9001 :
9005 : ACCTS. 800 -> 899
9009 :
9010 DATA 805,BAD DEBTS
9020 DATA 810,PENALITIES
9030 DATA 820,COST OF ASSETS SOLD
9040 DATA 830,MISCELLANEOUS EXPENSES
9090 DATA 0,0
9099 :
9100 : Months
9101 :
9110 DATA January
9112 DATA February
9114 DATA March
9116 DATA April
9118 DATA May
9120 DATA June
9122 DATA July
9124 DATA August
9126 DATA September
9128 DATA October
9130 DATA November
9132 DATA December
```

More →

The Phone Link Acoustic Modem

Sleek . . . . Quiet . . . .Reliable



U.S. ROBOTICS INC.
203 N. WABASH ✓181
SUITE 1718
CHICAGO, ILL 60601
(312) 346-5650

WHY USE OUR INTEGRATED ACCOUNTING SYSTEM (IAS)?

IT'S EASY TO USE. Prompts guide the user through each entry and then checks the entry to make sure only proper data are saved on the disk. It won't let you post an out-of-balance entry. IAS includes a complete users manual that tells you what each program does and how to use it. We even include a practice disk so you can begin making entries within minutes after receiving our IAS.

IT'S FAST. Our proprietary Skip Sequential™ file structure lets you save data on the disk at maximum speed without wasting disk space. We've also minimized keystrokes to make more efficient use of your operator's time.

IT GIVES YOU THE INFORMATION YOU NEED. The complete IAS package has over 30 reports, listings and file printouts so you can monitor the firm's fiscal position at all times, including instantaneous account balances. Our efficient file structure also means there's no monthly "erasing" of data files. You'll appreciate this if you're ever required to reconstruct an audit trail for some past month.

WE SUPPORT OUR SOFTWARE. Since IAS is not a translation of someone else's work, but was written by us from scratch, we know it cold. If you ever have a problem, we can answer it for you. We also give you full credit on any future packages that might replace the one you purchased. Our record over the past three years has been a good one, and we'll do everything we can to keep you a satisfied customer.

PRICE. The General Ledger costs $125.00; the complete IAS package (GL, AP, AR and PR) is $350.00. The user's manual is $20.00 (refunded with purchase). Since IAS is designed for the North Star DOS and Basic and will run in as little as 32K of memory, you don't need to buy more memory, a different operating system and Basic. This savings alone could pay for the software—and then some. You can pay a lot more, but shouldn't you check us out before you do?

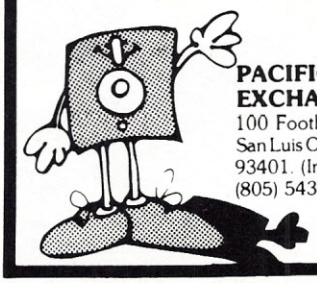
master charge THE INTERBANK CARD

ECOSOFT ✓82
P.O. Box 68602
Indianapolis, IN 46268
(317) 283-8883
(Phone Orders Only)

✓ Reader Service—see page 226

dy/an Dysan CORPORATION

Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted. All orders sent postage paid.



PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037.)

✓274

ADVENTURES FOR
8K PET®
16K TRS-80®
16K TRS-80® COLOR

ESCAPE FROM MARS—Explore an ancient Martian city while you prepare for your escape.
NUCLEAR SUBMARINE—Fast moving excitement at the bottom of the sea.
PYRAMID—Our most advanced and most challenging adventure. Takes place in our own special ancient pyramid.
VAMPIRE CASTLE—A day in old Drac's castle. But it's getting dark outside.
DEATH SHIP—It's a cruise ship—but it ain't the Love Boat and survival is far from certain.
TREK ADVENTURE—Takes place on a familiar starship. Almost as good as being there.

$14.95 each

Aardvark Technical Services ✓292
1690 Bolton
Walled Lake, MI 48088
(313) 669-3110 or (313) 624-6316
PET & TRS-80 are trademarks of Commodore and Tandy Corp.

LEARN

Having trouble learning to use your computer?

Reference manuals don't teach. Most BASIC texts don't cover specific personal computers.

TIS solves these problems with step-by-step books tailored for your machine.

For PET/CBM

Understanding Your PET/CBM $16.95
Vol 1: Basic Programming
PET Graphics ..... $ 6.95

For OSI CIP/C4P

Understanding Your C1P/C4P ..... $ 9.95
A Workbook of BASIC Exercises

Money Back Guarantee. VISA/MC accepted.

All prices include UPS or 1st Class postage.

TIS, Dept KB ✓95
Box 921
Los Alamos, NM 87544

Listing 8. CHART.COR program.

```
0001 : CHART.COR
0002 :
0003 : Embry  3/1/80
0004 :
0005 : kb article
0006 :
0007 : Corporation
0008 :
0010 HOME
0012 LINE= 0:W=30
0030 PRINT "Getting Data."
0040 DLM=OFF
0090 GOSUB 1000::Get Ready
0099 :
0100 : Introduction
0101 :
0105 HOME
0110 PRINT "    This program will permit you to obtain a"
0112 PRINT "listing of the current status of your Chart-Of-Accounts."
0114 PRINT "You will also be given the option of making any"
0116 PRINT "corrects you think necessary."
0130 PRINT
0140 PRINT "IF YOU DON'T KNOW WHAT YOU ARE DOING CALL YOU SUPERVISOR."
0150 PRINT
0160 INPUT "DO YOU KNOW WHAT TO DO  (Y/N)  ",Q$
0162 IF Q$="n" THEN Q$="N"
0164 IF Q$="N" THEN 900
0166 IF Q$="y" THEN Q$="Y"
0168 IF Q$<>"Y" P."YOU ENTERED ";Q$;". DO IT RIGHT.":GOTO 150
0170 RECNO #19=14:GOSUB 9020
0172 LET D$=A$::DATE
0190 RECNO #19=13:GOSUB 9020:W$=A$::NAME
0199 :
0200 : Selection
0201 :
0205 HOME
0210 PRINT TAB(W/2);"CHART OF ACCOUNT CORRECTION PROGRAM"
0211 PRINT
0212 PRINT "1. List Chart-of-Accounts"
0218 PRINT "2. Make corrections to Chart-of-Accounts"
0219 PRINT "3. Return to Ledger control"
0220 PRINT
0222 INPUT "MAKE SELECTION  ",S
0224 IF S<1 THEN 200
0226 IF S>2 THEN 900
0230 IF S=1 GOSUB 8900::PORT ?
0280 ON S GOSUB 8000,8300
0290 GOTO 200
0299 :
0900 : Done
0901 :
0910 DLM=ON
0990 CHAIN LEDGER.BAS
0999 :
1000 : Get Ready
1001 :
1010 OPEN #19,0:MASTER.DAT
1020 OPEN #11,0:CHART.DAT
1022 LET T=RSIZE #11
1030 PRINT "You have ";T;"accounts."
1040 WAIT 5
1090 RETURN
1099 :
2000 : Change COA
2001 :
2005 HOME
2010 PRINT "     <  ASSETS = LIABILITIES + EQUITY >"
2011 PRINT
2012 PRINT "ITS YOUR JOB TO KEEP IT BALANCED!!!"
2014 PRINT
2030 GOSUB 7000::do Binary Search
2040 IF F1<>0 THEN 2070
2050 GOSUB 3000::VIDEO AND CHANGE
2052 GOSUB 9000::PUT
2060 GOTO 2090
2070 PRINT CHR$(7)
2080 PRINT "ACCT. # ";N;" DOES NOT EXIST."
2090 RETURN
2099 :
3000 : Video  &  Change
3001 :
3010 HOME
3020 PRINT "1.  ACCOUNT #";TAB(W);A
3022 PRINT "2.  DESCRIPTION";TAB(W);A$
3023 DIGITS= 2
3024 IF A<400 THEN PRINT:GOTO 3026
3025 PRINT "3.  CURRENT BALANCE";TAB(W);B
3026 PRINT "4.  ACCOUNT TOTAL";TAB(W);C
3027 DIGITS= 0
3028 PRINT
3030 INPUT "IF O.K. ENTER '0' ELSE NUMBER TO CHANGE ",Y
3032 IF Y=1 P."CAN'T CHANGE ACCOUNT #.":WAIT 5:GOTO 3090
3035 IF Y<=.5 THEN 3090
```

More →

Now NRI takes you inside the world's most popular microcomputer to train you at home as the new breed of computer specialist!



NRI teams up with Radio Shack to teach you how to use, program and service microcomputers...make you the complete technician.

It's no longer enough to be just a programmer or a technician. With microcomputers moving into the fabric of our lives (over 200,000 of the TRS-80™ alone have been sold), interdisciplinary skills are demanded. And NRI can prepare you with the first course of its kind, covering the complete world of the microcomputer.

Learn At Home in Your Spare Time

With NRI training, the programmer gains practical knowledge of hardware, enabling him to design simpler, more effective programs. And, with advanced programming skills, the technician can test and debug systems quickly and easily.

Only NRI gives you both kinds of training with the convenience of home study. No classroom pressures, no night school, no gasoline wasted. You learn at your convenience, at your own pace. Yet you're always backed by the NRI staff and your instructor, answering questions, giving you guidance, and helping you over the tough spots.



Training includes TRS-80 computer, transistorized volt-ohm meter, digital frequency counter, and the NRI Discovery Lab with hundreds of tests and experiments.

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

Explore the TRS-80 Inside and Out

NRI training is hands-on training, with practical experiments and demonstrations as the very foundation of your knowledge. You don't just program your computer, you introduce and correct faults ...watch how circuits interact...interface with other systems...gain a real insight into its nature.

You also build test instruments and the NRI Discovery Lab, performing over 60 separate experiments in the process. You learn how your trouble-shooting tools work, and gain greater understanding of the information they give you. Both microcomputer and equipment come as part of your training for you to use and keep.

Send for Free Catalog... No Salesman Will Call

Get all the details on this exciting course in NRI's free, 100-page catalog. It shows all equipment, lesson outlines, and facts on other electronics courses such as Complete Communications with CB, TV and Audio, Digital Electronics, and more. Send today, no salesman will ever bother you. Keep up with the latest technology as you learn on the world's most popular computer. If coupon has been used, write to NRI Schools, 3939 Wisconsin Ave., Washington, D.C. 20016.

NRI As We Grow

NRI Schools
McGraw-Hill Continuing Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016
NO SALESMAN WILL CALL
Please check for one free catalog only.



All career courses approved under GI Bill.
☐ Check for details.

- ☐ Computer Electronics Including Microcomputers
- ☐ TV/Audio/Video Systems Servicing
- ☐ Complete Communications Electronics with CB • FCC Licenses • Aircraft, Mobile, Marine Electronics
- ☐ CB Specialists Course
- ☐ Digital Electronics • Electronic Technology • Basic Electronics
- ☐ Small Engine Repair
- ☐ Electrical Appliance Servicing
- ☐ Automotive Mechanics
- ☐ Auto Air Conditioning
- ☐ Air Conditioning, Refrigeration, & Heating including Solar Technology

Name (Please Print) Age

Street

City/State/Zip

Accredited by the Accrediting Commission of the National Home Study Council 172-011

TOLL FREE ORDERING



These Fine Products and More

NORTHSTAR	
HRZ 1-32K-D	$1990
HRZ 2-32K-D	2295
HRZ 2-32K-Q	2690
HARD DISC SYSTEM	3935
DYNABYTE	
DB 8/1 48K	$2395
DB 8/2 48K	3900
DB 8/4	3030
32M PHOENIX	11800
TERMINALS	
TELEVIDEO 912C	698
TELEVIDEO 920C	748
SOROC IQ-120	695
PRINTERS	
NEC 5510 (w TRACTORS)	2575
NEC 5520 (w TRACTORS)	2900
TI-820	1640
TI-810	1495
ANADEX DP-9500	1345
CENTRONICS 737	850
EPSON TX80	CALL

MORROW	
DISCUS 2D 2 DRIVE	1550
DISCUS 2 + 2 1 DRIVE	1265
DISCUS M26 HARD DISC	3990
SOLID STATE MUSIC	KIT Asm
CB2 Z80CPU	200 265
VB1C VIDEO	140 190
SB1 SYNTHESIZER	195 270
MEASUREMENT SYSTEMS MEMORY	
DM3200 32K 4MHz	480
DM6400 64K 4MHz	595
DMB6400 64K 4MHz BNK SEL	745
SOFTWARE-DISCS	
NORTHSTAR SOFTWARE	CALL
WORDSTAR	350
DATASTAR	250
MAGIC WAND	290
GRAHAM-DORIAN	CALL
STRUCTURED SYSTEMS	CALL
5" DISCS	27
8" DISCS	35

WE WILL TRY TO BEAT ANY ADVERTISED PRICE

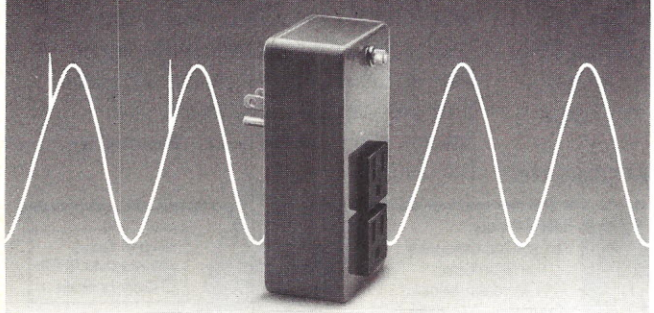
Automated Equipment Inc.

18430 Ward ✓96

Fountain Valley, CA 92708

(714) 963-1414 (800) 854-7635

Kill Surges Like Lightning!



Permanent protection for small computers, communications, medical and other sensitive electronic equipment. Surge Sentry works in parallel with the power line to shunt destructive power surges in picoseconds! Triggers at 10% above the nominal peak voltage.

At $89.50, it's less than the cost of a service call. Easy to install for immediate protection. Several models to choose from to fit your specific application.

For details and a free brochure, call or write:

RKS ENTERPRISES, INC. ✓46

643 South 6th Street, San Jose, CA 95112

(408) 288-5565

Dealer inquiries invited.

Listing 8 continued.

```
3040 PRINT "ENTER CORRECTION  ";
3044 IF Y=2 INPUT A$
3046 IF Y=3 INPUT B
3048 IF Y=4 INPUT C
3050 IF Y>4 THEN 3030
3060 GOTO 3000
3090 RETURN
3099 :
5000 : Print COA
5001 :
5010 FOR X=1 TO T
5011 RECNO #11=X:GOSUB 9010
5012 PRINT #Q,X;
5015 PRINT #Q,TAB(W1);A;
5020 PRINT #Q,TAB(W2);A$;
5030 GOSUB 9200::$ TO PRINT
5032 IF A<400 THEN 5044
5040 PRINT #Q,TAB(W3);B;
5044 PRINT #Q,TAB(W4);C
5050 GOSUB 9300::no $ to Print
5055 IF IMOD(X,5)=0 THEN PRINT #Q
5060 NEXT X
5090 RETURN
5099 :
7000 : Binary Search
7001 :
7010 LET L=1:U=T
7020 LET I=INT((L+U)/2)
7022 IF I=0 THEN 7080
7024 IF L>U THEN 7080
7030 SET RECNO #11=I:GOSUB 9010
7040 IF N=A THEN F1=0:GOTO 7090::Found
7050 IF N<A THEN U=I-1:GOTO 7020
7060 IF N>A THEN L=I+1:GOTO 7020
7080 LET F1=1::Error Flag
7090 RETURN
7099 :
8000 : List COA
8001 :
8005 IF Q=1 THEN HOME
8007 IF Q<>1 THEN PRINT #Q
8010 GOSUB 9600::Print Header
8020 GOSUB 9400::Label Columns
8030 GOSUB 5000::Get and Print information
8040 LET L$="==":GOSUB 9500
8080 IF Q<>1 THEN SKIP #Q,15
8090 RETURN
8099 :
8300 : Make Corrections
8301 :
8310 PRINT
8320 INPUT "Which Account # to Modify  ",N
8330 GOSUB 2000::Search & Change
8340 PRINT
8380 INPUT "Want to Modify another account  (Y/N)  ",Q$
8382 IF Q$="Y" THEN 8300
8384 IF Q$="y" THEN 8300
8390 RETURN
8399 :
8900 : Port-of-Print
8901 :
8910 LET W1=8:W2=16
8920 INPUT "Which port for output  ",Q
8930 IF Q=1 THEN W3=49:W4=59
8940 IF Q<>1 THEN W3=59:W4=69
8990 RETURN
8999 :
9000 : PUT   -> CHART.DAT
9001 :
9005 PUT #11,A,A$,B,C,D
9008 RETURN
9009 :
9010 : GET    ->   CHART.DAT
9011 :
9012 GET #11,A,A$,B,C,D
9018 RETURN
9019 :
9020 : GET   ->  MASTER.DAT
9021 :
9022 GET #19,A,B,A$
9028 RETURN
9029 :
9200 : $ TO PRINT
9201 :
9210 DIGITS= 2
9230 RJUST= 6
9290 RETURN
9299 :
9300 : NOT $ TO PRINT
9301 :
9310 DIGITS= 0
9320 RJUST= 0
9390 RETURN
9399 :
9400 : PRINT HEADER FOR C.O.A.
9401 :
```

More →

Listing 8 continued.

```
9410 PRINT #Q,"ACCT. #";
9420 PRINT #Q,TAB(W2-2);"DESCRIPTION";
9430 PRINT #Q,TAB(W3);"CURRENT";
9440 PRINT #Q,TAB(W4+3);"BALANCE"
9450 LET L$="= ":GOSUB 9500
9490 RETURN
9499 :
9500 : Print L$
9501 :
9510 FOR X=1 TO (W4+10)/2
9520 PRINT #Q,L$;
9530 NEXT X
9540 PRINT #Q
9590 RETURN
9599 :
9600 : Header for report
9601 :
9610 PRINT #Q,TAB(35-LEN(W$)/2);W$
9620 SKIP #Q,2
9630 PRINT #Q,TAB(35-LEN(D$)/2);D$
9640 SKIP #Q,2
9650 LET L$="**":GOSUB 9500
9690 RETURN
```

Listing 9. RESET.COA program.

```
0001 : RESET.COA
0002 :
0003 : Embry  3/1/80
0004 :
0005 : Kb article
0006 :
0007 : Corporation - Service
0008 :
0010 HOME
0099 :
0100 : Instructions
0101 :
0110 PRINT "THIS WILL RESET TO ZERO = 0 ALL(!!!!) DOLLARS"
0112 PRINT "IN THE CHART-OF-ACCOUNTS!"
0114 PRINT
0120 INPUT "IS THIS WHAT YOU WANT  (Y/N) ",Q$
0122 IF Q$="N" P."I THOUGHT NOT.":GOTO 990
0124 IF Q$<>"Y" THEN 120
0130 INPUT "ENTER PASSWORD AND IT SHALL BE DONE ",Q$
0132 IF Q$<>"PASSWORD" P."WRONG PASSWORD - BYE!":END
0199 :
0200 : DO IT
0201 :
0210 OPEN #10,1:CHART.DAT
0212 PRINT "# OF ACCOUNTS = ";RSIZE #10
0220 FOR X=1 TO RSIZE #10
0222 IF IMOD(X,10)=0 P.X;
0228 SET RECNO #10=X
0230 GET #10,A,A$,B,C,D
0240 LET B=0:C=0
0250 PUT #10,A,A$,B,C,D
0260 NEXT X
0990 CHAIN BEGIN
```

Listing 10. MASTER.CHG program.

```
0001 : MASTER.CHG
0002 :
0003 : Embry  3/1/80
0004 :
0005 : Kb article
0006 :
0008 :
0020 LINE= 0
0030 GOSUB 9800::Psm. Variables
0099 :
0100 : INTRO.
0101 :
0110 HOME
0120 PRINT "This will allow you to check & change the"
0122 PRINT "data in a file named 'MASTER.DAT'."
0130 PRINT
0140 INPUT "WANT A PRINT-OUT  (Y/N) ",Q$
0142 IF Q$="y" THEN Q$="Y"
0144 IF Q$="Y" GOSUB 7500::Print out wanted
0199 :
0200 : SELECT
0201 :
0205 HOME
0207 PRINT "ENTER A '0' TO TERMINATE."
```

More

Computers Terminals Modems

We are the stocking terminal distributor offering full service, on-site maintenance coverage.

CRT's			
Perkin-Elmer Bantam 550B	$749	Perkin-Elmer Super Owl 1250	$1799
Microterm Act VA	779	Microterm Mime IIA	819
IBM 3101 Model 10	1191	IBM 3101 Model 20	1375
Dec VT100	1699	Televideo 912C	799
Televideo 920C	839		
Hardcopy Terminals			
DEC LA34AA	939	DEC LA34DA	1149
Teletype Model 43 KSR with RS232C and connector cable	1049	NEC Spinwriter 5520 Typewriter quality with Tractor, ribbon, thimble	3088
Printers			
Perkin-Elmer 650/655 CRT Screen Printer 100 CPS	999	NEC Spinwriter 5510 Typewriter quality with Tractor, ribbon, thimble	2754
Microline 80	594		
Centronics 737	828	Centronics 779	1068
call for other Centronics models			
Modems			
Bell 212A — Penril 300/1200 1200 and 300 Baud/Manual originate auto answer	799	Bell 103/113 — USR-330 300 Baud/Manual originate auto answer	339
Auto dial option	799	Auto dial option	50
(Both modems connect to phone lines via RJ11C standard extension phone jack.)			
Acoustic Coupler		**Computers**	
Phone Link — 300 Baud	179	USR-1600P	4099
Originate and answer. Compact.			

Leasing rates on request. Write or call for product information.
10 day money back guarantee on all products.



U.S. ROBOTICS INC.
203 N. WABASH
SUITE 1718
CHICAGO, ILL 60601
(312) 346-5650
221

779 UPPER CASE/lower case "Conversion Kit I"

Expand the capabilities of your 779 line printer to include word processing!! Available to all Centronics 779 and TRS 80 Printer I owners is the option of lower case and changing slash 0 Zero to standard 0. No etch cuts or soldering needed. Installs in minutes with a screwdriver. No program modification or additional interface is required. **Price $125.00**

UPPER/LOWER CASE NOW AVAILABLE FOR THE FOLLOWING CENTRONICS PRINTERS:
101AL, 102BL, 306, 500, 501, 503, 700, 701, 702, 703, 780, 781.

Motor Control "CONVERSION KIT II"
FOR ALL CENTRONICS 779 & TRS 80 PRINTER I LINE PRINTERS!!

Our "Conversion Kit II" Motor Controller gives your 779 the ability to turn the motor on and off automatically. Removes the annoying noise of constant run, increasing the life span of your 779 and TRS 80 line printer motor! No soldering, software or hardware changes needed. Installs easily. **Price $95.00**

SAVE! Buy Service Technologies "Conversion Kit I" and "Conversion Kit II" together for the single price of **$199.00**

To order, please send check or money order in the proper amount to:



Service Technologies, Inc.
32 Nightingale Rd.
Nashua, N.H. 03062
(603) 883-5369
208

Visa and Master Charge accepted (please include signature, expiration date and phone number).

RECESSION PUTTING A BITE ON YOUR BUSINESS?

Inventory going wild? Receivables out of control? Cash flow bind hurting?

Being deluged with paperwork that just won't quit? Before you throw money away chasing after over priced, over sized computers.

TALK TO US

about low cost, effective alternatives. Small Business Systems Group is in the business of helping small business people survive our country's economic rollercoaster by providing the kind of small computer system which really fits both your business and your budget. And gives you room for future growth.

6 Carlisle Road
Westford, MA 01886
(617) 692-3800

SMALL BUSINESS SYSTEMS GROUP

✓143

TRS-80*

SAVE A BUNDLE

When you buy your TRS-80™ equipment!

Use our toll free number to check our price before you buy a TRS-80™ . . . anywhere!

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation

full Radio Shack warranty

TAB ✓189

SALES COMPANY

1412 WEST FAIRFIELD DR.

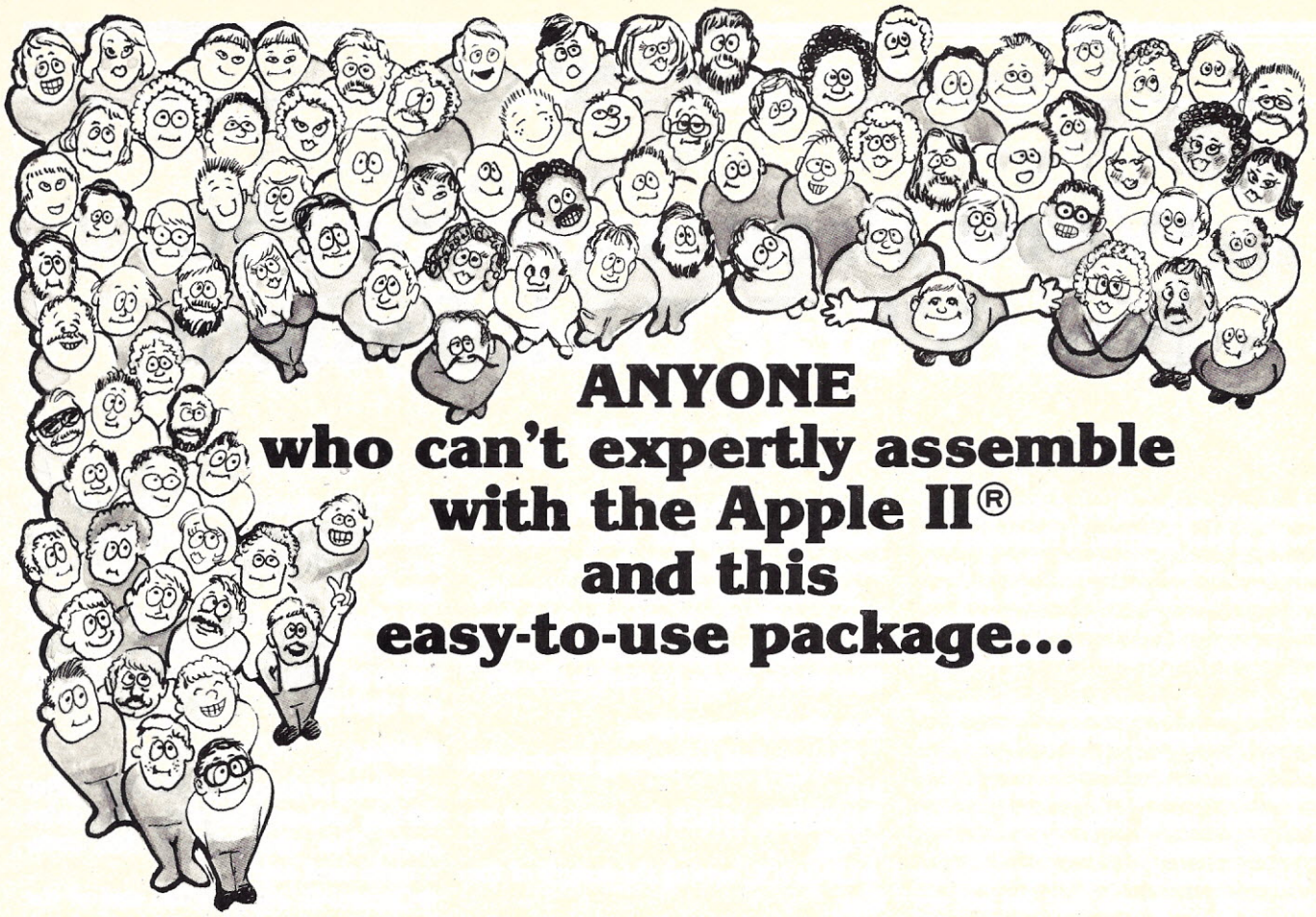
P.O. BOX 8098 PENSACOLA FL 32505

904/438-6507

nationwide 1-800-874-1551

Listing 10 continued.

```
0210 INPUT "WHICH RECORD # TO CHECK  ",R
0212 IF R=0 THEN 900
0214 IF R>RSIZE #19 THEN 900
0220 RECNO #19=R
0230 GET #19,A,B,A$
0240 PRINT
0250 PRINT A$(R,1);TAB(W);A
0252 PRINT A$(R,2);TAB(W);B
0256 PRINT A$(R,3);TAB(W);A$
0260 PRINT
0262 INPUT "O.K.  (Y/N) ",Q$
0264 IF Q$="Y" THEN 290
0266 IF Q$="y" then 290
0270 PRINT "NEW VALUES"
0272 INPUT "A = ",A
0274 INPUT "B = ",B
0276 INPUT "A$= ",A$
0280 PUT #19,A,B,A$
0290 INPUT "ANOTHER (Y/N) ",Q$
0310 IF Q$="N" THEN 900
0312 IF Q$="n" then 900
0330 GOTO 200
0399 :
0900 : DONE
0901 :
0910 INPUT "Want a print out  (Y/N) ",Q$
0912 IF Q$="Y" GOSUB 7500
0914 IF Q$="y" GOSUB 7500
0970 CLOSE #19
0980 DLM=ON
0990 CHAIN LEDGER.BAS
0999 :
1000 : DATA
1001 :
1010 DATA RESERVED,RESERVED,MONTH
1020 DATA TODAY'S DATE FORMATTED,JULIAN DAY,MONTH
1030 DATA RESERVED,RESERVED,MONTH
1040 DATA RESERVED,RESERVED,MONTH
1050 DATA RESERVED,RESERVED,MONTH
1060 DATA RESERVED,# IN TRANS.DAT,MONTH
1070 DATA PROFIT - P&L,END OF MONTH FLAG,MONTH
1080 DATA RESERVED,RESERVED,MONTH
1090 DATA RESERVED,RESERVED,MONTH
1100 DATA RESERVED,SPARE,MONTH
1110 DATA RESERVED,RESERVED,MONTH
1120 DATA RESERVED,RESERVED,MONTH
1130 DATA SPARE,SPARE,NAME
1140 DATA SPARE,SPARE,TODAY-READABLE
1150 DATA SPARE,SPARE,SPARE
1160 DATA SPARE,SPARE,SPARE
1170 DATA SPARE,SPARE,SPARE
1180 DATA SPARE,SPARE,SPARE
1190 DATA SPARE,SPARE,SPARE
1200 DATA SPARE,SPARE,SPARE
1210 DATA SPARE,SPARE,RESERVED
1220 DATA SPARE,SPARE,ADDRESS
1230 DATA SPARE,SPARE,CITY-STATE-ZIP
1240 DATA SPARE,SPARE,RESERVED
1250 DATA SPARE,SPARE,RESERVED
1299 :
7500 : PRINT OUT
7501 :
7510 INPUT "Which port for output  ",Q
7512 IF Q<>3 THEN HOME
7513 : Sets DEC LA-34 for 8 lines/inch and 10 characters/inch
7514 IF Q<>1 PRINT #Q,ESC(91);CHR$(51);CHR$(119)
7518 PRINT #Q
7520 PRINT #Q,TAB(W-LEN(N$)/2);N$
7522 PRINT #Q,TAB(W-LEN(D$)/2);D$
7524 SKIP #Q,2
7530 PRINT #Q,"REC.#";TAB(W);"Description & Value"
7540 FOR X=1 TO RSIZE #19
7550 RECNO #19=X
7552 GET #19,A,B,A$
7568 PRINT #Q,X;" ";
7570 PRINT #Q,A$(X,1);"=";A;TAB(W1);A$(X,2);"=";B;TAB(W2);A$(X,3);"=";A$
7572 IF IMOD(X,5)=0 PRINT #Q
7580 NEXT X
7590 RETURN
7599 :
9800 : Psm. variables
9801 :
9805 DLM=ON ::set delimiter to ','
9810 LET W=38
9812 LET W1=37:W2=65
9830 DIM A$(25,3)
9832 FOR X=1 TO 25
9834 READ A$(X,1),A$(X,2),A$(X,3)
9836 NEXT X
9880 DLM=OFF
9882 OPEN #19,0:MASTER.DAT
9884 RECNO #19=14
9886 GET #19,A,B,D$::date
9888 LET N$="MASTER.DAT File Contents"
9890 RETURN
```



ANYONE who can't expertly assemble with the Apple II® and this easy-to-use package...



just isn't meant to program.

If you're really interested in programming...assembly language is the only way to go. It's faster, more versatile, and lets you fine-tune programs so they work exactly your way.

Whether you're a beginner, in-betweener, or an advanced programmer, our 4-part assembler package is just your speed. You'll find it's easy to learn, easy to use and more powerful. Of course, you can buy any of the programs separately. Or, for a limited time get the complete 4-part package for your 48K Apple II* with DISK II drive, at the **special price of $99.95.** Look what it includes!

LISA.

This is the mainstay. It's the only interactive assembler that's so easy to use, whatever your skill level. With an average speed of 20K lines per minute, it's 4 to 20 times faster than others. Since it's a symbolic assembler, you don't have to keep track of addresses. It also provides 30 pseudo opcodes and comes with approx. 140 pages of easy to understand, superior documentation. **$49.95.**

XREF/65 - SCTOLISA - SORT 2.0.

This program handles the details like a master. XREF/65 allows you to create cross-reference listing of all variables and labels. And it helps reduce debugging and documentation time. SORT 2.0 sorts and displays the LISA symbol tables, while SCTOLISA can automatically convert SC Assembler** 3.2 files to LISA. **$19.95.**

TRACE/65.

It delivers more control and reduces debugging time dramatically. Its symbolic trace listings mean you can forget wasting time looking up addresses in symbol tables. Its ability to stop listing at any time means you have sure control. And its four breakpoints let you change registers, memory locations etc. during trace. **$24.95.**

DISASM/65.

This is the disassembler that's easy to use, for you, me, anyone! Because you have control and decide what code should be instruction or data. And it allows you to go in and create LISA based text files for programs where you've never seen the source code. **$29.95.**

Entire 4-part package, on diskettes, complete documentation, and backed by Programma International, only **$99.95!** (A $24.85 saving.)

*Apple II is a trademark of Apple Computer, Inc.
**SC Assembler is a trademark of S-C Software

PROGRAMMA

Programma International, Inc.
2908 N. Naomi Street,
Burbank, Ca. 91504 ✓277
(213) 954-0240

✓ Reader Service—see page 226

This secretary has a way with words.

Word Processor for the North Star Disk System

By G. L. Haller

I recently replaced my Sol computer with a new Horizon II that uses the standard serial terminal. But I realized afterwards that I would not be able to use my favorite word processor, which requires memory mapping.

At first, I considered adding a memory-mapped interface board to the Horizon. But that would have meant converting my terminal to accept video input and would almost have amounted to a double system.

I then decided to see what could be done with programs that did not require memory mapping.

I studied the descriptions of several, and of those tested, Maryelln by Gary Young best suited my needs. At about the same time, Young announced a much-improved version, which he calls Secretary. Since receiving and testing it, I am satisfied that I need not worry about my lack of a memory-mapped system.

Briefly, Secretary uses a line-oriented program and can include the formatting commands in the program.

Configuring

When you first run the disk, it will ask if it is to be reconfigured. After it is, the disk will not ask again, but may be reconfigured at any time by the command CONFIGURE. The Secretary program will then be set to the computer memory size available, the type of character to be used for back space, single or double density, a stop at the end of each page, lines per screen, screen line length and the line wrap-around.

This latter feature, when in the AUTO line-numbering mode, will automatically go to the next line when the line length of the terminal is used. In any case, the bell will sound when you are within seven characters of the end of the line. The Secretary program may then be saved on disk for future use.

Secretary is written in assembly language for the North Star Disk System. It starts at 2D00 and may be configured for single or double density.

Pre-Text Formatting

The pre-text formatting commands are:

- JUSTIFY, which can be turned on or off.
- LINE XX, setting the length of the line.
- MARGIN XX,XXX, which sets the right and left margins.
- OFFSET XX, which sets the left margin only.
- PAGE XX,XX,XX, which defines a page, the maximum lines, the number of printed lines and the line number of the first line of the text.
- PNUM XX, starting the numbering of the pages.
- SPACE XX, setting the spaces between lines.
- TABSET X1, X2, and so on, which sets up to ten tabs.
- TITLE TEXT1, which sets the title to be printed at the top of each page.

Many of the above commands, while principally used pre-text, may also be used combined with the text.

In-Text Formatting

1. An in-text command allows indenting with either right- or left-hand margins or both.
2. A left arrow centers the text with respect to the line length.
3. Tabs that follow the TABSET command can be used.
4. Data can be merged from a BASIC file. This is done in sequence by the use of an up arrow in the text. This is especially useful in form letters with different addresses or comments in the text.
5. Underlining may be accomplished by using the ampersand before and after the text to be underlined.
6. Brackets around any portion of text will evoke the JUSTIFY command or will line-fill if justification is not desired.

Editing

Editing is done with the North Star editing conventions and a few extra ones. The usual North Star commands used are:

- Control-G, copy to the end of the line.
- Control-D, copy to a specific character.
- Control-Z, delete a character.
- Control-A, copies one character.
- Control-Q, back space one character.
- Control-Y, toggle the insert mode.
- Control-N or control-P, reedit the old line.
- Control-C, exit the command with the line unaltered.

Other commands not in North Star include:

- FIND TEXT1, which locates all occurrences of TEXT1.
- CHNG, which changes selected text and waits for approval or non-approval.
- CHAL, which changes all selected text without approval.
- COPY, which copies text in newly selected lines but leaves the old lines.
- MOVE, which copies text in newly selected lines and deletes old lines.
- LIST command, which will list to any output device. See UNIT command.
- RENUMBER, which renumbers lines.
- OPEN, which opens up line num-

Dr. G. L. Haller, 1500 Galleon Drive, Naples, FL 33940.

bers in selected line sequences for insertion of more lines of text.

- SCRATCH, which deletes all lines.
- APPEND, which may be used to bring two programs together. Then, by the use of the OPEN and MOVE commands, the text may be placed as desired.
- DELETE, will delete a line or a series of lines on command.

Saving Programs to Disk

Again, the North Star conventions are used with respect to saving and loading from disk files. By using the FREE command, not only the length of the program is given, but also the number of blocks, so that the NSAVE command may be used efficiently. More than one disk drive can be used in the conventional way. A DIRECTORY command will output a directory of the files, and in the DOS operation, the LI command will also list the text files.

Special Commands

Quite a few special commands are helpful in the operation of any program. They include:

- HELP, which will list the first four letters of all valid commands. The first four letters are all that are needed for a command. Either lowercase or uppercase letters may be used. This listing is also done automatically after an invalid command.
- NULL XX, which will generate XX nulls after each C/R.
- QUIT, which will leave the program and return to DOS. From DOS, a JP 2D00 will go back to Secretary; a JP 2D04 will go back to Secretary and retain the text program in memory.
- CALL, which allows a call to a machine language program in the computer memory. A sample of this is in the Secretary program.
- FREE, which will print the number of bytes used, the number still available, the last line number and the blocks used.
- A NULL command to insert a specified number of nulls following each carriage return.
- RECOVER, which will attempt to recover programs destroyed by operator error.
- COMMENT, which can be embedded in the program to have nonprinting comments in the listing.
- MERGING, which may be done from a separate BASIC file for inserting material such as sequential addresses or comments into the program. A BASIC program is provided to produce the BASIC files for merging.
- A back slash to terminate a page. If a number follows the back slash, the program will look to see if that many lines can still be printed on that page; if so, it will disregard the back slash.

Messages

Forty-four messages will aid you in using the Secretary program. These messages will indicate that your commands have been accepted, or that the file in disk is too small to accept a save, or a file in disk is too large for your memory, or many others.

Listing and Printing

The UNIT command will cause the program to output on the desired output device. Unit 1 will output on the #1 output device, and Unit 0 will output on the #0 device (usually the video terminal). When in the Unit 0 mode, the output will stop at screen full, and wait for a Return to continue for both listing and printing. On any other Unit number the output is continuous, but printing follows the directions of the PAGE commands on the video screen so that you can observe what the final format will look like. Be sure to return to Unit 0 for a video listing after a hard-copy printing.

Miscellaneous Comments

I have set up several formats of pretext short programs so that when I know what letter form I will use, I simply load that format and add the text.

There is only one minor irritation in running the program, and it is in the editing mode. When searching for a character with the control-D command, if you are looking for the second occurrence of the same character you must use control-A to get the cursor off the first find.

Conclusion

The documentation that comes with the program is complete and includes a 30-page book of instructions. Two text files that illustrate the entire range of the features of Secretary are included. A thorough instruction lesson is provided by listing and printing these two programs.

The program is well worth $85. It may be bought from the author, Gary Young, PO Box 3218, North Hollywood, CA 91609. I purchased mine from American Square Computers, Jamestown, NC 27282. ■

Introducing

MCE™ PROGRAMS

Micro-Computer Educational Programs

Interpretive Education, providing leadership in educational programs for basic living skills, introduces the new microcomputer educational (MCE) programs. The MCE programs are being thoroughly developed and tested with the cooperation of educators and computer programming experts. The new high technology product line is being generated to offer basic living skills on floppy disc and tape. They are designed for application on Apple II*, TRS-80** and other microcomputers.

Please call collect today for more information on how MCE programs can aid your teaching efforts with special needs audiences.

*A trademark of Apple Computer, Inc.
**A trademark of Tandy Corporation

For free information and catalog, write or CALL COLLECT: **(616) 345-8681**

INTERPRETIVE EDUCATION ✓195
Dept. 17F
2306 Winters Dr. Kalamazoo, MI 49002

ADD lowercase with our PLUG-IN piggyback board!

CENTRONICS

NOW! Add lowercase and optional second character sets to **ALL MODELS*** Centronics printers — including the popular 101A and 779: 96 Character ASCII; Optional character sets: APL, TRS-80/H-19 Graphics, Scientific, Customer-defined. *Except 730, 737 and 6000-series

Available now in two versions:
5 x 7 dot matrix — $ 95.00 (A&T)
9 x 7 dot matrix — $135.00 (A&T)
Optional Character Set — add $15.00
Postage Paid on Prepaid Order

ALSO: Refurbished Printers!
Limited quantity now in stock:
730-1: $450 **306: $595**
101/101A: $795 **103: $995**
102: $1195 Shipped postage collect

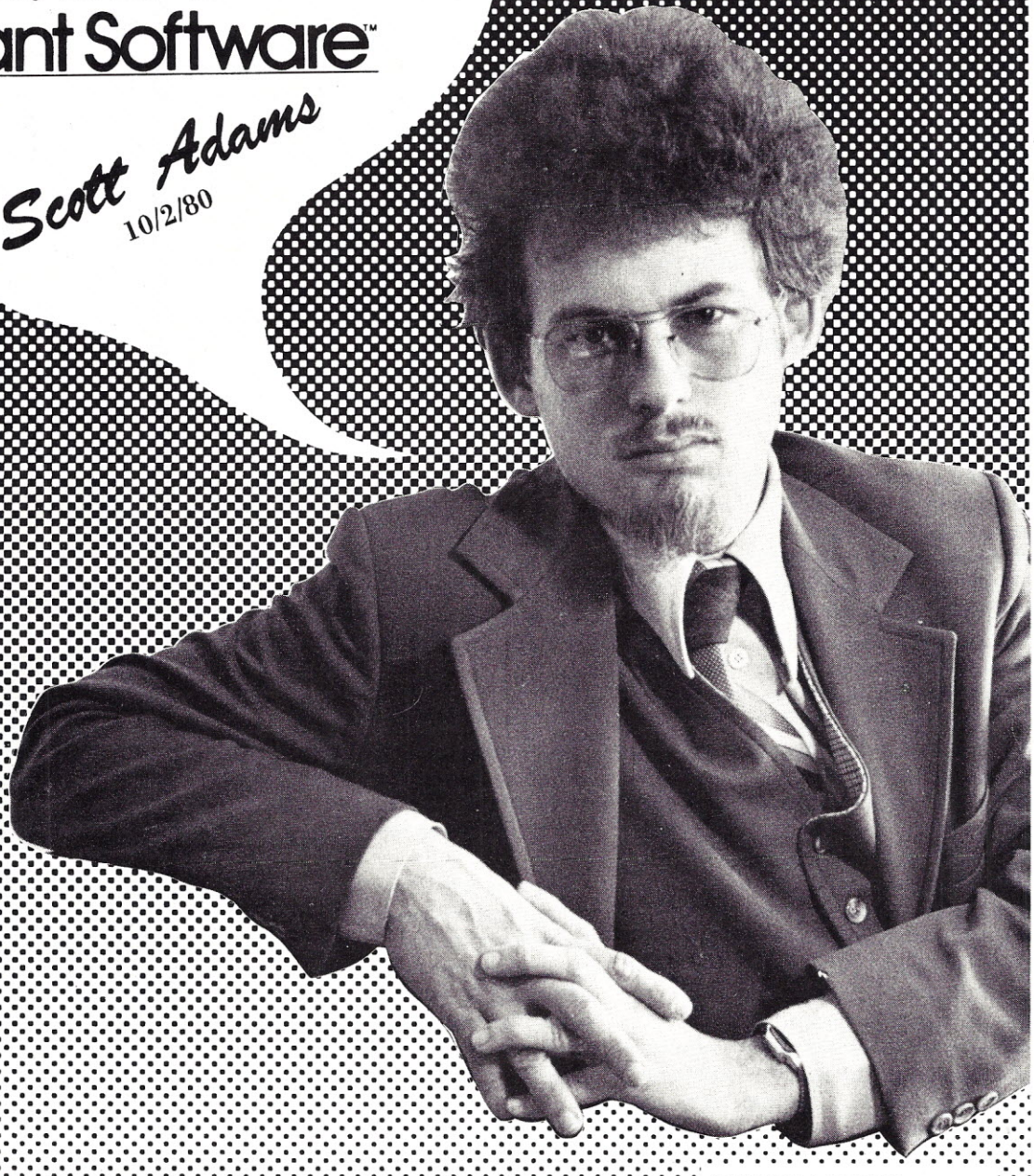
DSE Digital Systems Engineering ✓61
12503 King's Lake Drive
Reston, Virginia 22091
(703) 620-2994
All products waranteed 90 days
MasterCard, VISA, Check, MO, PO

✓ Reader Service—see page 226

In all my dealings with software houses the one company which has always impressed me with its high quality service has been

Instant Software™

Scott Adams
10/2/80



SCOTT ADAMS,
President of
Adventure International
and author of the
"Adventure" Series.

Instant Software™

PETERBOROUGH, NEW HAMPSHIRE 03458 603-9247296

Instant Software™

Now Sells The Adventure Series*

YOU CAN CALL 1-800-258-5473 TO ORDER THESE NEW INSTANT SOFTWARE OFFERINGS. OR STOP BY ONE OF OUR 300 DEALERS THROUGHOUT THE U.S.A. AND THE WORLD, FOR PERSONALIZED SERVICE.

*AND MORE

ADVENTURE!

ALL 3 PAKS
TRS-80 32K
Apple 48K

1) **ADVENTURELAND** - You wander through an enchanted world trying to recover the 13 lost treasures. You'll encounter wild animals, magical beings, and many other perils and puzzles.
TRS-80 Tape Order No.5501R

2) **PIRATE'S ADVENTURE** - "Yo ho ho and a bottle of rum...."You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island.
TRS-80 Tape Order No.5505R

3) **MISSION IMPOSSIBLE ADVENTURE** Good morning, your mission is to....and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed?
TRS-80 Tape Order No.5507R

3 PAKS
Apple
No.5503AD
TRS-80
No.5504RD

4) **VOODOO CASTLE** - Count Cristo has had a fiendish curse put on him by his enemies. There he lies, with you his only hope.
TRS-80 Tape Order No.5508R

5) **THE COUNT** - You wake up in a large brass bed in a castle somewhere in Transylvania. Who are you, what are you doing here, and WHY did the postman deliver a bottle of blood?
TRS-80 Tape Order No.5511R

6) **STRANGE ODYSSEY** - Marooned at the edge of the galaxy, you've stumbled on the ruins of an ancient alien civilization complete with fabulous treasures and unearthly technologies.
TRS-80 Tape Order No.5512R

3 PAKS
Apple
No.5509AD
TRS-80
No.5510RD

7) **MYSTERY FUN HOUSE** - Can you find your way completely through the strangest Fun House in existence.
TRS-80 Tape Order No.5513R

8) **PYRAMID OF DOOM** - An Egyptian Treasure Hunt leads you into the dark recesses of a recently uncovered Pyramid.
TRS-80 Tape Order No.5516R

9) **GHOST TOWN** - Explore a deserted western mining town in search of 13 treasures from rattlesnakes to runaway horses, this Adventure's got them all!
TRS-80 Tape Order No.5517R

3 PAKS
Apple
No.5514AD
TRS-80
No.5515RD

Prices: All Tapes 16K . . .$14.95
All 3 Paks Disk . . $39.95

MORE*

STAR TREK 3.5: Get those Klingon's! The newest, most sophisticated Star Trek version by the Grand Master - Lance Micklus. The top program of it's kind available.
TRS-80 Mod.1 L.II 16K
Order No.5518RD $19.95 Disk
Order No.5519R $14.95 Tape

SLAG: War gaming at it's best. Real time graphics combined with long range planning make this an exciting, fascinating game.
TRS-80 Mod.1 L.II 16K
Order No.5520R $14.95 Tape

ASTEROID: The real time, high resolution graphics game that's a smash hit at Arcades all over the world. Three levels of difficulty. Save your quarters.
Apple 2 Disk
Order No.5521AD $19.95

KID VENTURES: #1 Little Red Riding Hood. Allows your child to interact with the story, learning as they go. Designed for readers and non readers alike. Includes sound and play along cassette tape.
TRS-80 Mod. 1 16K
Order No.5522R $14.95 Tape to Disk

GALACTIC EMPIRE: Good strategy space war game. You as commander of Galactica's Imperial forces, must capture and hold the 20 inhabited worlds of the Galactic System.
TRS-80 Mod. 1 16K
Order No.5523R $14.95 Tape
Order No.5524RD $19.95 Disk

GALACTIC TRILOGY: Special all three games of the Trilogy - Galactic Empire, Galactic trader, and Galactic Revolution all on one disk at a special savings.
TRS-80 Mod. 1 16K
Order No.5525RD $39.95

★ **INTERACTIVE FICTION:** The computer sets the scene with a fictional situation. Then you become a character in the story. When its your turn to speak, you type in your response. The resulting dialogue and even the plot will depend on what you say.

SIX MICRO STORIES: An introduction to interactive fiction. Involves the reader in a variety of situations from being a spy to a pilot in a doomed 747 and more.
Order No.5526RD $14.95 Disk TRS-80 Mod. 1 16K

LOCAL CALL FOR DEATH: A detective story considerably more challenging them the above program.
Order No.5527RD $19.95 Disk TRS-80 Mod. 1 16K

TWO HEADS OF THE COIN: Psychological Mystery set in the London of Sherlock Holmes. Most challenging of all. Will tax your observational and imaginitive skills.
Order No.5528RD $19.95 Disk TRS-80 Mod. 1 16K

We Guarantee It!

Instant Software Guarantee

OUR PROGRAMS ARE GUARANTEED TO BE QUALITY PRODUCTS. IF NOT COMPLETELY SATISFIED YOU MAY RETURN THE PROGRAM WITHIN 60 DAYS. A CREDIT OR REPLACEMENT WILL BE WILLINGLY GIVEN FOR ANY REASON.

DEALERS:

Instant Software is offering you SUBSTANTIAL discounts when ordering these top selling programs. Just call toll-free 1-800-532-5474, to place your order. WE SHIP RIGHT AWAY!!! Call us, if you need any further information.

✓40

Instant Software™

PETERBOROUGH, NEW HAMPSHIRE 03458 603-924-7296

✓ Reader Service—see page 226

KILOBAUD KLASSROOM NO.24

Connecting to the Outside World

Now that you've learned something of assembly- and machine-language programming, you're ready to tackle some complete programs.

Peter A. Stark
PO Box 209
Mt. Kisco, NY 10549

Last month we covered assembly language for our Kilobaud Klassroom Komputer and gave some examples of simple programming. But no program is complete without some input and output. Since the primary I/O device for our computer is the 6820/6821 PIA, let's examine that next.

The PIA

The PIA is Motorola's parallel interface adapter IC, a parallel I/O device specifically designed to work with processors in the 6800 family. It is available under the numbers 6820 or 6821; it is also identical with the 6520, which is designed to go with the 6500-series processors.

As shown in Fig. 1, the PIA has a group of pins which connects to the 6800 (shown on the left) and another group of pins which connects to external devices (shown on the right). In most applications we are concerned with the latter group.

The 20 I/O pins shown at the right are divided into ten for port A and ten for port B. Except for some slight electrical differences, the two ports are identical in most applications.

Each port contains eight data lines and two handshaking lines. The data lines can be used for both input or output (though not at the same time) in any combination. For example, of the eight lines on one port, three could be used for input, while the other five are outputs.

In addition, two more lines on each port are the handshaking lines. One of these must be used for input, while the other can be either an input or an output. While they can be used for general-purpose I/O as well, their programming is a bit more complex than the eight data lines, and so they are usually reserved just for handshaking in parallel systems. In simple applications (such as controlling a heating system or burglar alarm) they would probably not be used unless needed.

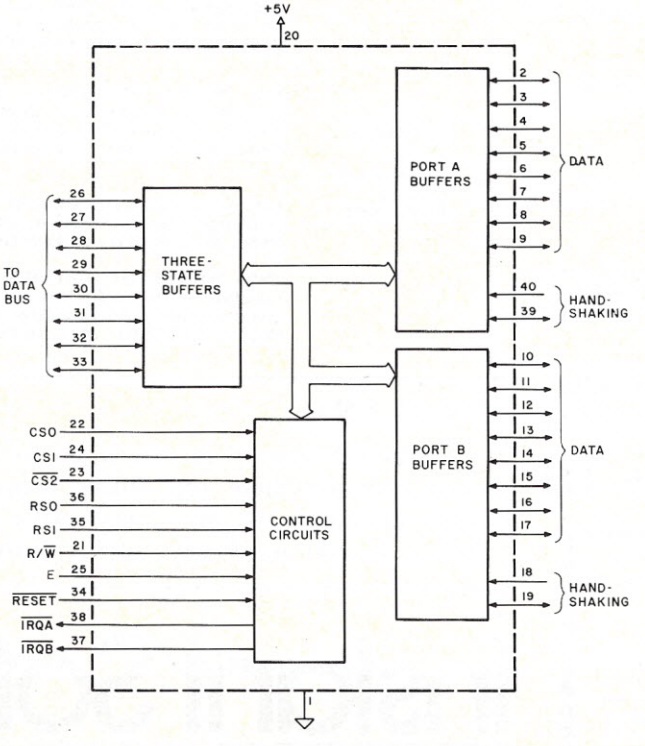


Fig. 1. PIA block diagram.

All of these lines are said to be "TTL compatible"; that is, the signals on them are 0 volts and +5 volts, such as those of TTL logic. Though they can connect directly to TTL devices, they do not have the current-handling capabilities of TTL devices. Moreover, the PIA is an MOS device and can thus be damaged by static electricity. Hence, some kind of driver amplifier or isolation device will be used between PIA pins and the outside world.

PIA Programming

In our system, the PIA is connected to the address bus of the computer in two ways. First, its $\overline{CS2}$ chip select signal is driven from an output on the 74LS138 address decoder. There is provision for two PIAs on the board, but let's consider only the first.

```
START CLR   A  $A001   Clear port A control
      LDA   A  #$07
      STA   A  $A000   Store 00000111 into direction
      LDA   A  #$04
      STA   A  $A001   Store 00000100 into control
```

Listing 1.

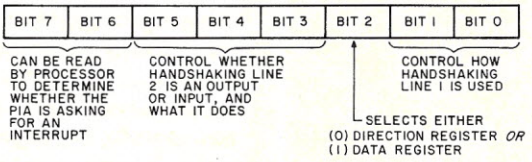


Fig. 2. The PIA control register.

This one is driven from the 74LS138 output which goes low for addresses in the range from A000 through BFFF. Thus, the PIA occupies this entire range of addresses, and any instruction which references these addresses will, in some way, activate the PIA.

In addition, however, the RS0 line shown in Fig. 1 connects to bit A0 of the address bus, and RS1 connects to A1. The status of these two address lines is also received by the PIA, and affects it in different ways. These two bits determine which part of the PIA is addressed.

Since these two address lines can take on any one of four values (00, 01, 10 or 11), the PIA responds to these as four different addresses. For example, the hex address A000 ends with the bits 00, whereas hex address A003 ends with the bits 11. Thus, the addresses A000 through A003 access the PIA in four different ways.

You'll note that address A004 again ends with the bits 00, just as A000 did; so does A008, A00C, A010 and so on. As it turns out, there are 2K addresses in the range of A000-BFFF that end with 00, another 2K that end with 01, 2K that end with 10, and 2K that end with 11. There are many different addresses we could use to refer to the PIA, but just to keep it simple, from now on we will use only the addresses A000-A003 and ignore the rest (even though the PIA does not).

Of these addresses, A000 and A001 apply only to port A, while A002 and A003 apply only to port B. The four addresses are used as follows:

A000—Port A data and direction registers
A001—Port A control register
A002—Port B data and direction registers
A003—Port B control register

Each port has two addresses, and, except for one small difference (having to do with the handshaking lines), the two ports are programmed in identical ways.

First, you will note that addresses A001 and A003 are used for just one register each, while A000 and A002 service two registers each. Though this seems like an unnecessary complication, in actual use it is not so inconvenient. When power is first applied, these addresses are used for the direction registers, while after some initialization they apply only to the data registers.

The direction registers determine which bit of which port is an output pin and which is an input. As mentioned earlier, any line on either port can be either an input or an output, though not at the same time. The decision as to which bit is which is made by the direction register. If a given bit of the direction register is 0, the corresponding bit of the port is an input. If the bit is a 1, then that bit of the port is an output. (The easiest way to remember this is by writing 0 = I—0 = Input and Output = 1. It's just the opposite of what you would expect.)

For example, the following instructions

```
LDA A #$07    Load 07 into A acc
STA A $A000   Store into port A Dir. Reg
```

place a binary 00000111 (hex 07) into the direction register. This makes the first five bits of the port into inputs, and the last three bits into outputs.

The data registers are used for actual communication with each port. To output from the port, the program simply stores data into the data register; to input from the port, it simply loads data from the register.

The control register is used for two-way communication between the processor and the PIA. Each of the bits in this register has a specific use, and by using the control register, the processor can manipulate the handshaking lines, control the generation of interrupts by the PIA and manipulate the PIA in other ways, as well as sense what the PIA is doing.

Fig. 2 shows the meaning of the eight bits in the control register. Five bits are used by the processor to control the two handshaking lines of each port, while two other bits can be read by the processor to determine whether this PIA port is asking for an interrupt.

Of special interest to us right now is bit 2. As you remember, the PIA data and direction registers share one address; bit 2 of the control register determines which of these two is actually used by that address. If this bit is 0, then the direction register is selected; if this bit is 1, then the data register is selected.

When the computer is first started, the same RESET signal which resets and initializes the 6802 processor also resets all the registers of the PIA to 0. At the beginning, bit 2 of the control register is automatically 0, and so addresses A000 and A002 apply to the direction registers. One of the first steps of a program would therefore initialize these registers to tell the PIA how it is going to be used.

Once this initialization is done, the program would normally store 00000100, or hexadecimal 04, into the control register. This sets bit 2 so that from now on the processor accesses the data register instead of the direction register.



Reader Service—see page 226

Listing 2. ACTESTER—the acoustic coupler test program.

```
                    NAM   LISTING   2

                ************************************
                * ACOUSTIC COUPLER TESTER PROGRAM *
                * FOR THE KILOBAUD KLASSROOM      *
                * SINGLE-BOARD 6802 COMPUTER      *
                ************************************

                * DEFINE MEMORY ADDRESSES FOR COMPUTER
   (F800)       ROM     EQU   $F800
   (0000)       RAM     EQU   $0000
   (007F)       STACK   EQU   $007F
   (A000)       PIA1    EQU   $A000
   (A000)       PIADRA  EQU   PIA1
   (A001)       PIACRA  EQU   PIA1+1

                * RAM DATA
   (0000)               ORG   RAM
0000            CHAR    RMB   1          CURRENT CHARACTER BEING TRANSMITTED
0001            BITCTR  RMB   1          COUNTER FOR 8 BITS PER ASCII CHARACTER

                * MAIN PROGRAM

                * START AND INITIALIZATION
   (F800)               ORG   ROM
F800 8E 007F    START   LDS   #STACK      SET STACK POINTER TO TOP OF RAM
F803 7F A001            CLR   PIACRA      RESET PIA CONTROL REGISTER
F806 86 FF              LDA A #$FF
F808 B7 A000            STA A PIADRA      SET DIR REG A FOR OUTPUT
F80B 86 04              LDA A #$04
F80D B7 A001            STA A PIACRA      TURN ON BIT 2 OF CONTROL REG

                * SEND FIVE SECONDS OF 1 (MARK) BEFORE STARTING
F810 CE 0226    WAIT    LDX   #550        FIVE SEC TIMES 110 BITS PER SEC
F813 8D 2B      WAIT1   BSR   MARK        SEND OUT A 1
F815 09                 DEX
F816 26 FB              BNE   WAIT1       AND REPEAT 550 TIMES
F818 CE F870            LDX   #TEXT       POINT INDEX REGISTER TO TEXT

                * NOW SEND OUT THE NEXT CHARACTER
F81B A6 00      GO      LDA A 0,X         GET THE NEXT CHARACTER
F81D 97 00              STA A CHAR        AND SAVE IT
F81F 81 04              CMP A #$04        IS THIS THE END OF TEXT?
F821 27 ED              BEQ   WAIT        YES -- WAIT AND REPEAT
F823 86 08              LDA A #8          GET READY TO COUNT 8 BITS
F825 97 01              STA A BITCTR
F827 8D 2F              BSR   SPACE       SEND OUT START PULSE (0 = SPACE)
                * MAIN SHIFT LOOP TO SEND OUT NEXT BIT
F829 74 0000    SHIFT   LSR   CHAR        MOVE NEXT BIT INTO CARRY
F82C 24 04              BCC   SEND0       SEND OUT 0 IF CARRY=0
F82E 8D 10              BSR   MARK        OUTPUT A 1
F830 20 02              BRA   COUNT8
F832 8D 24      SEND0   BSR   SPACE       OUTPUT A 0
F834 7A 0001    COUNT8  DEC   BITCTR      HAVE WE SENT 8 BITS?
F837 26 F0              BNE   SHIFT       NO -- GO BACK TO SEND NEXT BIT
F839 8D 05              BSR   MARK        YES -- SEND OUT A STOP BIT
F83B 8D 03              BSR   MARK        AND ANOTHER STOP BIT
F83D 08                 INX               POINT INDEX TO NEXT CHARACTER
F83E 20 DB              BRA   GO          AND GO BACK TO SEND NEXT CHAR

                * SUBROUTINE TO SEND OUT A MARK (1)
                * SEND OUT 20 CYCLES OF 2225 HZ; EACH HALF-CYCLE
                * IS 201 MACHINE CYCLES AT A .8947 MHZ CLOCK FREQ.

F840 C6 14      MARK    LDA B #20         SEND 20 CYCLES
F842 86 01      MARK1   LDA A #1
F844 B7 A000            STA A PIADRA      POSITIVE HALF-CYCLE
F847 86 20              LDA A #32         SET UP WAIT LOOP
F849 4A         MARK2   DEC A
F84A 26 FD              BNE   MARK2       WAIT
F84C 7F A000            CLR   PIADRA      NEGATIVE HALF-CYCLE
F84F 86 1F              LDA A #31         SET UP WAIT LOOP
F851 4A         MARK3   DEC A
F852 26 FD              BNE   MARK3       WAIT
F854 5A                 DEC B             NEED MORE CYCLES?
F855 26 EB              BNE   MARK1       YES -- GO BACK
```

Let's assume that we want to set up port A so that five lines are inputs and three are outputs. The initialization sequence is shown in Listing 1, which first clears the control register, thereby making sure that bit 2 is 0 so the next step will load 00000111 into the direction register to set five bits for input and three for output. Once this is done, storing hex 04 into the control register sets bit 2 so that succeeding instructions will affect the data register. (The first step is not really necessary, but is a good safety precaution to make sure the control register is reset, just in case the RESET signal did not do a good enough job.)

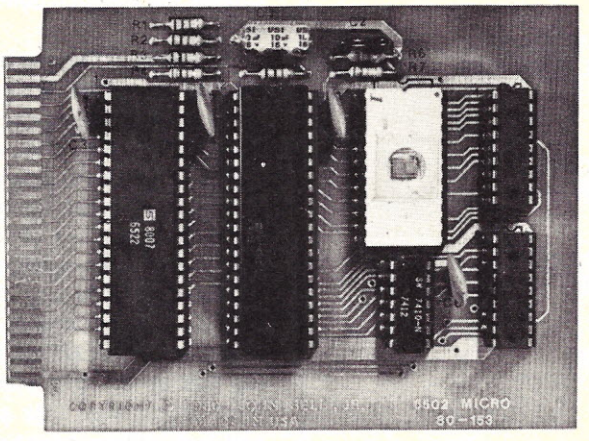
A Complete Program

Now that we have looked at the various aspects of programming our Kilobaud Klassroom Komputer, it's time to put them all together and look at some complete programs. Let's start with the ACTESTER program which appeared in Kilobaud Klassroom No. 20 (September 1980 issue of *Kilobaud Microcomputing*, p. 85.) This program is reprinted here as Listing 2.

The object of this program is to output audio to an acoustic coupler (via a speaker or earphone), which can be decoded by the coupler and displayed on a terminal or printer. Though this program occupies less than a tenth of the 2716 EPROM on our computer, it has a lot of different functions and is an excellent demonstrator of computer programming.

The program outputs a message (which reads "THIS IS THE KILOBAUD KLASSROOM 6802 SINGLE-BOARD COMPUTER . . .") at 110 baud, the speed normally used by mechanical teleprinters. Fig. 3 shows what a typical ASCII character of this message looks like; this is the letter A, which has the hex code 41, or binary 01000001.

As described in earlier installments, serial data sent to a terminal usually consists of a start pulse (which is always 0), the eight data bits (sent backward) and one or two stop bits (which are always 1). Between characters, 1 is sent. In Fig. 3 we have



A 6502 CONTROL COMPUTER that features:

- 1024 Bytes of RAM (two 2114s)
- 2048 Bytes of EPROM (2716)
- Uses one 6522 VIA
  - 2 8-bit bidirectional I/O ports
  - 2 16-bit programmable timer/counters
  - Serial Data Port
  - Latched output and input with handshaking logic
  - TTL and CMOS compatible
- Interfaces with JBE Solid State Switch & A-D & D-A Converter.
- Uses JBE 5V power supply.
- 2716 EPROM available separately.
- 50 pin connector included in kit & assm. unit.

JOHN BELL ENGINEERING'S 6502 MICROCOMPUTER, 2716 EPROM Programmer & Apple II Parallel Interface plus the Apple II Microcomputer — **A COMPLETE DEVELOPMENT SYSTEM:**

- SOFTWARE CAN BE WRITTEN WITH THE APPLE II MINI ASSEMBLER AND TESTED IN THE APPLE USING THE JOHN BELL ENGINEERING PARALLEL I/O CARD. WITH THE PARALLEL I/O CARD AND EPROM PROGRAMMER, THE PROGRAM CAN BE TRANSFERRED TO A 2716 AND RUN IN YOUR 6502 COMPUTER.

- JOHN BELL ENGINEERING 6502 MICROCOMPUTER IS A DEDICATED COMPUTER DESIGNED FOR CONTROL FUNCTIONS. USES FOR THIS COMPUTER ARE ENDLESS — LIMITED ONLY BY YOUR IMAGINATION.

- HOME SECURITY SYSTEM
- HEAT CONTROL
- LIGHT CONTROL
- SOLAR HEATING AND POWER SYSTEMS
- AUTOMATIC CONTROL OF TAPE RECORDERS
- AUTOMATIC CONTROL OF VIDEO RECORDERS
- ROBOT CONTROL
- AUTOMATIC TELEPHONE DIALERS
- CONTROL OF ELECTRIC WHEEL CHAIR
- COMMUNICATION SYSTEMS FOR THE DISABLED
- AUTOMATED SLIDE SHOW CONTROL
- TRAFFIC LIGHT CONTROL
- ELECTRIC TRAINS
- IRRIGATION SYSTEMS
- MOVING ELECTRIC SIGNS
- ELECTRONIC GAMES
- COMPLEX LOGIC FUNCTIONS
- CONTROL OF YOUR COFFEE POT, TOASTER, POPCORN MACHINE, NEGATIVE ION GENERATOR, HAIR DRYER, TOOTH BRUSH AND ROCKET SHIP. . .

6502 MICROCOMPUTER

80-153 ASSM **$110.95**
BARE BOARD **$24.95** KIT **$89.95**

6522 APPLE II INTERFACE

79-295 ASSM **$69.95**
BARE BOARD **$22.95** KIT **$59.95**

2716 EPROM PROGRAMMER

80-244 ASSM **$49.95**
BARE BOARD **$24.95** KIT **$39.95**
2716 EPROM **$19.95**

JOHN BELL ENGINEERING ✓99

VISA

ALL PRODUCTS ARE AVAILABLE FROM: **JOHN BELL ENGINEERING**
P.O. BOX 338 • REDWOOD CITY, CA 94064 • (415) 367-1137
ADD 6% SALES TAX IN CALIFORNIA. ADD 5% FOR SHIPPING AND HANDLING.

MASTER CHARGE

```
F857 39          RTS              NO -- SO EXIT

                 * SUBROUTINE TO SEND OUT A SPACE (0)
                 * SEND OUT 18 CYCLES OF 2025 HZ; EACH HALF-CYCLE
                 * IS 221 MACHINE CYCLES AT A .8947 MHZ CLOCK FREQ.

F858 C6 12       SPACE  LDA B #18        SEND 18 CYCLES
F85A 86 01       SPACE1 LDA A #1
F85C B7 A000            STA A PIADRA     POSITIVE HALF-CYCLE
F85F 86 24              LDA A #36        SET UP WAIT LOOP
F861 4A          SPACE2 DEC A
F862 26 FD              BNE   SPACE2     WAIT
F864 7F A000            CLR   PIADRA     NEGATIVE HALF-CYCLE
F867 86 22              LDA A #34        SET UP WAIT LOOP
F869 4A          SPACE3 DEC A
F86A 26 FD              BNE   SPACE3     WAIT
F86C 5A                 DEC B            NEED MORE CYCLES?
F86D 26 EB              BNE   SPACE1     YES -- GO BACK
F86F 39                 RTS              NO -- SO EXIT

                 * TEXT TO BE PRINTED OUT
F870 0D          TEXT   FCB   $D,$A,7,0,0,0
F876 54                 FCC   'THIS IS THE KILOBAUD KLASSROOM 6802 '
F89A 53                 FCC   'SINGLE-BOARD COMPUTER'
F8AF 0D                 FCB   $D,$A,7,0,0,0
F8B5 4E                 FCC   'NOW IS THE TIME FOR ALL GOOD MEN TO '
F8D9 43                 FCC   'COME TO THE AID OF THEIR COUNTRY.'
F8FA 0D                 FCB   $D,$A,0,0,0
F8FF 54                 FCC   'THE FOX JUMPED OVER THE LAZY DOG'
F91F 0D                 FCB   $D,$A,0,0,0
F924 30                 FCC   '0123456789!"#$%&'
F934 0D                 FCB   $D,$A,0,0,0
F939 04                 FCB   4

                 * 6802 RESET VECTOR AT FFFE-FFFF POINTS TO START

   (FFFE)                ORG   $FFFE
FFFE F8 00               FDB   START

                         END
```

a 1 before the character, then start with a 0 start pulse, follow with the bits 10000010 (which is the code for an A but sent with the least significant bit first) and end with two stop bits of 1. Two stop bits are always used at 110 baud, whereas higher speeds generally use only a single stop bit.

Since exactly 11 bits—counting the start bit, eight data bits and two stop bits—are sent for each character, sending data at 110 baud (which is 110 bits per second in this particular case) means that each character takes exactly 1/10 second, or 100 ms. Dividing this by 11 gives us a time of 9.09 ms for each bit of the character.

In this application, however, we want to send ASCII characters, not as digital pulses, but as tones which can be received by an acoustic coupler. An acoustic coupler is a device that might be used between a terminal and a telephone line to allow the terminal to talk with a computer at the other end of the telephone connection.

Since digital pulses cannot be sent on a telephone line, the bits are encoded as tones. Different tones are used in each direction so that data can be sent in both directions at the same time. The job of the acoustic coupler is to generate and receive these tones and couple them to the telephone acoustically.

Most often, the terminal end of the connection places the call to the computer; hence the acoustic coupler at the terminal is called an originate device, while the computer has an answer coupler. (The computer is generally directly, rather than acoustically, coupled to the phone line, and the coupler is called a modem rather than an acoustic coupler.)

The originate coupler encodes its data by sending a tone of 1270 Hz for 1 and 1070 Hz for 0; the answer modem sends its data using a tone of 2225 Hz for 1 and 2025 Hz for 0. So we must generate 9.09 ms of 2225 Hz tone for 1, and 9.09 ms of 2025 Hz tone for 0.

At 2225 Hz, each cycle of tone takes 1/2225 second, which means there is time for about 20 cycles in the 9.09 ms devoted to one data bit.

Likewise, at 2025 Hz a cycle of tone takes 1/2025 second, which allows time for about 18 cycles in the 9.09 ms devoted to one data bit.

The program sends the tone out one of the PIA bits as a square wave, simply by turning the bit on and off. Though the resulting tone is a square wave rather than a sine wave, it is generally rounded off by an inexpensive speaker or earphone into something resembling a sine wave, so that the acoustic coupler will accept it quite well anyway.

The timing of the tone is handled by the 6802 processor. Since we are running the 6802 from a 3.579 MHz crystal, which results in a clock frequency of one-quarter of that, the resulting clock frequency of 0.8947 MHz makes each machine cycle about 1.118 ms long. At the 2225 Hz tone, a half-cycle lasts 1/4450 second, or 225 ms. Dividing this by the cycle time of 1.117 ms tells us that a new half-cycle of tone must be sent out every 201 or so machine cycles. Repeating the same calculation for the 2025 Hz tone gives a time of about 221 machine cycles.

Thus, the generation of the audio tones to be output is completely handled by the microprocessor—counting the number of machine cycles (either 201 or 221) sets the frequency of the tone, while generating a specific number of audio cycles (either 20 or 18) sets the duration of that tone.

All of this is handled by two subroutines within the program called Mark and Space. By tradition, the 1 signal is called a mark, so the Mark subroutine sends out 9.09 ms of 2225 Hz tone; the 0 signal is called a space, so the Space subroutine sends out 9.09 ms of 2025 Hz tone.

With this as a background, let's examine Listing 2 to see just how the program works.

The first part of the program tells the assembler what addresses to use for various components. In the basic computer, the 2716 EPROM occupies addresses F800 through FFFF, while RAM occupies addresses 0000 through 007F. Therefore, we define ROM at $F800 and RAM at $0000.

Since the stack is filled from

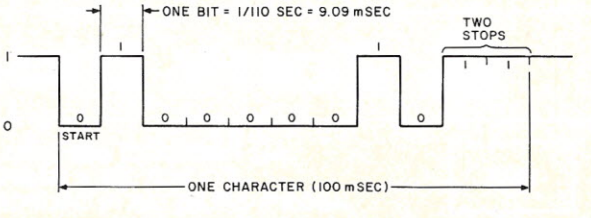


Fig. 3. An ASCII character (the letter A, hex 41) at 110 baud.

```
WAIT   LDX   #550    Load 550 into index
WAIT1  BSR   MARK    Send out 2225 Hz
       DEX           Decrement index
       BNE   WAIT1   Repeat if not 0
```

Listing 3.

the top down, we define the stack at location $007F, which is the top of the RAM in the system. PIA1 is addressed at location $A000, with the symbol PIADRA standing for PIA data/direction register A and PIACRA standing for PIA control register A. These two are located at addresses A000 and A001.

The next part of the program sets up space for two variables at the beginning of RAM. The statement ORG RAM tells the assembler to start allocating memory from location 0000 (since RAM had previously been defined to EQUal 0000). CHAR RMB 1 sets aside one location for the variable CHAR, which will hold the character currently being transmitted. BITCTR RMB 1 sets aside another location for a counter, which will be used to count eight bits.

Now follows the main program. The statement ORG ROM tells the assembler to assign space for it beginning at location ROM, which had previously been defined as address F800.

The instruction START LDS #STACK loads the stack pointer with 007F, thus telling it to allocate the RAM area from 007F down for the stack. (When you write your own programs for the 6802 computer, don't forget to initialize the stack pointer register to a free area of RAM as one of your first instructions; otherwise, you will be at a loss to figure out why the program doesn't work!)

The next four instructions initialize the PIA as follows:

```
CLR    PIACRA
LDA A  #$FF
STA A  PIADRA
LDA A  #$04
STA A  PIACRA
```

The first instruction makes sure that bit 2 of the control register is 0 so the program can load the direction register. The next two steps load a binary 11111111 into the direction register, thus making every bit of port A an output; the program only uses one bit for output, and initializing the others is done for no particular reason. Finally, storing 04 into the control register sets bit 2 and makes address A000 apply to just the data register.

Before sending out data, the output should be a constant 1. The next part of the program sends out five seconds of 2225 Hz tone. Since there are 110 bits per second, this means that 550 bits must be sent out. This is done in a loop as shown in Listing 3. Here the index register is used as a counter to execute the Mark subroutine 550 times while the index register counts down from 550 to 0.

When five seconds of 2225 Hz has been sent out, the instruction LDX #TEXT loads the index register with the address of the Text string which is at the end of the program.

The Text string is defined at the end of the program by a series of statements beginning with

```
TEXT   FCB $D,$A,7,0,0,0
```

The character $0D is a carriage return, $0A is a line feed, and $07 rings the bell; this is equivalent to BASIC's

```
TEXT$ = CHR$(13) + CHR$(10) + CHR$(7) +
CHR$(0) + CHR$(0) + CHR$(0) + . . .
```

and will eventually cause the terminal to go to the next line, ring the bell and print three nulls (code 0) which are needed by teleprinter machines to give them a bit of extra time to finish doing the carriage return prior to printing on the next line.

The next line of the text uses the FCC directive to tell the assembler to insert the ASCII codes for the letters THIS IS THE. . . . The text is broken up among several FCC statements, with FCBs inserted between lines to supply carriage returns and line feeds. Finally, the FCB 4 inserts a 04 code at the very end; the program will test for this to determine when the string ends. Thus, these 12 lines near the end of Listing 2 define a long string of ASCII text in memory ending with 04; the instruction LDX #TEXT at location F818 simply points the index register to the beginning of this string in preparation for sending out the next character.

In the next part of the program, GO LDA A 0,X is an indexed load instruction. The 0 near the end is an offset which is added to the address in the index register. Adding zero obviously does nothing, so the address in the index register is used exactly as is. Since it is pointing at the first character in the Text string, this instruction tells the computer to load that character into accumulator A. The STA A CHAR instruction following it tells the computer to store that character at location CHAR.

The next two instructions

```
CMP A  #$04
BEQ    WAIT
```

tell the computer to compare the character just picked up with a 04 code and branch to WAIT if it is equal to 04. This is the test which stops output when the 04 character at the end of the Text string is encountered and makes it restart.

Next, location BITCTR is initialized to 8 with

```
LDA A  #8
STA A  BITCTR
```

and will be used to count out eight bits. This is followed by a BSR SPACE instruction, which goes to the Space subroutine to send out 9.09 ms of 0 tone at 2025 Hz to act as a start pulse.

We finally get to the main loop, which sends out the eight bits of the character. It begins with

```
SHIFT  LSR  CHAR
```

The LSR instruction is a logical shift right. (See Table 1, the instruction set table, in Kilobaud Klassroom No. 22, on page 71 of the November 1980 issue of *Kilobaud Microcomputing*. Look at the right side of the table, where a picture similar to Fig. 4

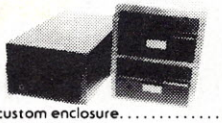
"TRS-80 is a registered trademark of TANDY CORP."

Model III, 4K.....$629.10
Model III, 16K.....$899.10
Model III, 32K.....$2245.50
Model II, 32K with 1 disk drive.....$3105.00
Expansion Interface.....$269.00
Expansion Interface 16K.....$403.20
Expansion Interface 32K.....$524.00
16K Memory Kit for TRS-80 or Apple.....$79.95



TRS-80 & NORTH STAR ADD-ON DRIVES

CUSTOM ENCLOSURE



CABLE INCLUDED

Single drive system in custom enclosure..... $400.00
Single drive system in metal enclosure..... $375.00
Double drive system in custom enclosure..... $806.00

MPI..... $275.00
MPI, B52, dual headed..... $349.00
Shugart SA400..... $275.00
Shugart SA800..... $479.00
Tandon single sided..... $279.00
Tandon double sided..... $425.00
Hazeltine 1000..... $450.00
Single tier walnut enclosure for Shugart..... $ 35.00
Double tier walnut enclosure for Shugart..... $ 32.00
Atari 400..... $548.49
Atari 800..... $795.00
Hazeltine 1410..... $749.00
Centronics PI Printer (TRS-80 add on)..... $398.95
Centronics 779-2 tractor (TRS-80 add on)..... $1049.95
TI Printer..... $1599.00
Base 2..... $649.00
Horizon 1, 32K..... $2290.00
Televideo 912..... $775.00

SPECIAL! MINI FLOPPY DISKS, box of 10 (with plastic box) only $28.00 (without plastic box) only $26.50. Box of 10. 8" disks (in plastic box $30.00). Centronic 779 ribbons $3.50 each.

tora systems INC ✓65

WE ACCEPT BANK AMERICARD, VISA, MASTER CHARGE
29-02 23rd Ave., Astoria, N.Y. 11105
TWX 7105822107 (212) 728-5252
(800) 221-1340

✓ Reader Service—see page 226

shows the operation of that instruction.) In this instruction, each bit of the location CHAR is shifted right one place; the rightmost bit, bit 0, goes into the carry bit (in the condition code register), while the leftmost bit, bit 7, is filled with 0.

The very first character is a carriage return, or the hex number 0D. This is shifted as follows:

	Location CHAR		Carry
Before:	0 0 0 0 1 1 0 1		-
After:	0 0 0 0 0 1 1 0	-->	1

Since we want to send out the eight bits of the character backward—that is, the least significant bit first—this moves that very same bit into the carry bit and removes it from CHAR.

The next four lines test the carry and send out a space if it is 0, or a mark if it is 1:

```
        BCC   SEND0
        BSR   MARK
        BRA   COUNT8
SEND0   BSR   SPACE
COUNT8...
```

If the carry bit is 0, the BCC (branch if carry clear) instruction sends the program to SEND0 to send out a space; otherwise, it sends out a mark (both of these are sent out by subroutines that it goes to with the BSR [branch to subroutine] instruction).

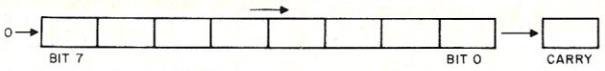


Fig. 4. The LSR instruction.

The next two instructions are

```
COUNT8 DEC   BITCTR
       BNE   SHIFT
```

The first decrements the bit counter, and the second sends the program back to SHIFT, as long as the result is not zero. The result is a loop which shifts CHAR eight times to the right, and sends out the character one bit at a time, starting from the right.

Finally, the computer performs two BSR MARK instructions to send out two stop bits. This completes the entire character, so an INX increments the index register to point to the next character in the string, and a BRA instruction branches back to GO to repeat the same process for the next character.

That completes the main body of the program, leaving us to explain only the Mark and Space subroutines. Except for different numbers, the two subroutines are identical. In fact, the same subroutine could have been used with just different initialization, but I chose to use separate ones to make the program easier to understand.

To send out a mark of 2225 Hz, we send out 20 cycles of tone, where each half-cycle lasts for about 201 machine cycles. The subroutine does this with three loops. An outer loop is repeated 20 times, with accumulator B acting as the counter. The two inner loops, one for each half-cycle, are repeated for 32 and 31 repetitions, respectively, and use accumulator A as the loop counter. The loop starts with

```
MARK    LDA B #20
MARK1   LDA A #1
        STA A PIADRA
```

where the B accumulator is initialized at 20, while the A accumulator is used to send 1 out to the rightmost bit of the PIA port A. This starts the positive half-cycle of the tone (the tone output is taken from bit 0 of port A, and is +5 volts on the positive half-cycle, and 0 volts on the negative half-cycle).

The next three instructions set up a wait loop as follows:

```
        LDA A #32
MARK2   DEC A
        BNE   MARK2
```

This time accumulator A is the counter. It is decremented, and the BNE instruction loops back to decrement A again until it reaches zero.

As the instruction set tables in the November installment show, the DEC A instruction takes two machine cycles, while the BNE takes four. The loop, therefore, takes six cycles, and thus 32 repetitions require 192 machine cycles total.

As you remember, we calculated that we need 201 cycles; the loop runs a bit less than that to give some extra time for those instructions outside the loop. (Actually, the program runs just a bit slow; it could have been fine-tuned to provide exactly the right time delays, but such care is not needed in this application.)

The next four instructions repeat the process, but this time sending out 0 to the PIA and looping 31 times for a total of 186 machine cycles. As before, some extra time is allotted to instructions outside the loop.

The subroutine ends with

```
DEC B
BNE   MARK1
RTS
```

where the B accumulator is decremented, and as long as it is not zero the program goes back to send out another positive half-cycle; otherwise, the RTS is like BASIC's RETURN to exit from the subroutine.

6802 Assembler Notes

There are several lines in the above program which will not work on the 6802 assembler we used last time.

First, this assembler will not like the plus sign in

```
PIACRA EQU   PIA1+1
```

Instead, you will have to define it more exactly as

```
PIACRA EQU   $A001
```

Second, this assembler does not like multiple bytes within a single FCB statement. Hence, the line

```
TEXT   FCB $D,$A,7,0,0,0
```

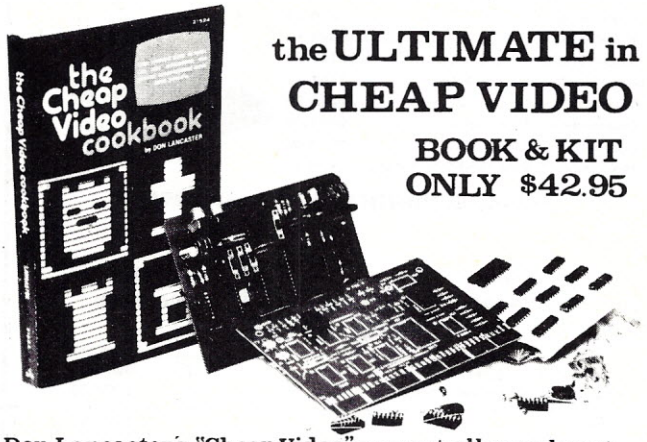
will have to be broken down into

```
TEXT   FCB $D
       FCB $A
       FCB 7
       etc.
```

Other than that you should have no trouble assembling this program.

Next Month

Kilobaud Klassroom No. 25 will be the last article in this series. We will develop an entire burglar alarm controller around our single-board computer. By way of comparison, look at the "Computerized Security and Status System" by Richard R. Parry on page 30 of the November 1980 issue of *Kilobaud Microcomputing*. That system could run exactly as described on the Kilobaud Klassroom Komputer. ■



the ULTIMATE in CHEAP VIDEO

BOOK & KIT ONLY $42.95

Don Lancaster's "Cheap Video" concept allows almost unlimited options, including:

* **Scrolling · Full performance cursor.**
* **Line/Character formats of 16/32, 24/80, 32/64 .... or almost anything.**
* **Graphics - up to 256 X 256 B&W; 96 X 128 COLOR (requires low-cost option modules)**
* **Works with 6502, 6800 and other micros.**

SPECIAL OFFER: Buy the Kit (upper case alpha-numeric option included) & get the Book at 1/2 price.

106 PAIA ELECTRONICS, DEPT. K, 1020 W. WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

I'm Sold, PLEASE RUSH..... ( ) SEND FREE CATALOG

( ) TVT-6 5/8 Kit & Cheap Video Cookbook $42.95

( ) TVT-6 5/8 Kit only (book required for assembly) - $39.95

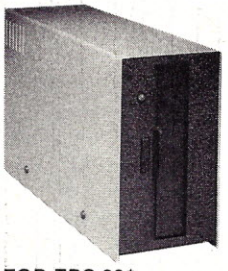
name: _____

address: _____

city: _____ state: _____ zip: _____

PAIA ELECTRONICS, Dept. K 1 1020 WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

WE WILL NOT BE UNDERSOLD



DISK DRIVES $314

40 track, 102K Bytes. Includes power supply and TRS-80* compatible silver enclosure. Ready to plug-in and run the moment you receive it. Can be intermixed with each other and Radio Shack drive on same cable. 90 day warranty. One year on power supply. Available for 220 Vac (50 Hz) operation. **External card edge included.**

FOR TRS-80*

CCI-100	5¼", 40 Track (102K Bytes) for Model I	**$314**
CCI-280	5¼", 80 Track (204K Bytes) for Model I	**$429**
CCI-800	8" Drive for Model II (½ Meg Bytes)	**$795**

For Zenith Z89

CCI-189	5¼", 40 Track (102K Bytes) add-on drive	**$394**
Z-87	Dual 5¼" add-on drive system	**$995**

DISKETTES — Box of 10 (5¼") – with plastic library case

Maxell $30 **BASF or Verbatim $24**

8" double density for Model II (box of 10) **$36**

CLEAR PLASTIC CASE – Holds 50 diskettes **$19**

DISK OPERATING SYSTEMS

PATCHPAK #4 by Percom Data **$ 8.95**

CP/M™ for Model I, Zenith **$145** • for Model II, Altos **$169.00**

NEWDOS Plus **40track** **$ 79.00**

NEWDOS 80 **$135.00**

COMPLETE SYSTEMS

ALTOS 64K, DD, SS, 2-Drive, 1MB **ACS 8000-2** **$3395**

APPLE 16K **$969**

TRS-80* Model II-64K **$3499**

TRS-80* Model III – 16K **$899**

TRS-80* Expansion Interface **$249**

ZENITH Z89, 48K all-in-one computer **$2440**

ZENITH Z19 **$735**

TELEVIDEO 920C **$748**

ATARI 400 $489 **ATARI 800 $747**

APF Game Only $ 95 **Complete System $489**

MATTEL INTELLIVISION **$229**

MONITORS

LEEDEX	12" B & W Video 100	**$129**
ZENITH	13" Color	**$379**
SANYO	9" B & W VM4509	**$155**
SANYO	12" B & W DM5012	**$210**
SANYO	12" Green Screen DM5112	**$215**
SANYO	13" Color DMC6013	**$375**
APF	9" B & W TVM-10	**$139**

TELECOMMUNICATIONS

LIVERMORE STAR MODEM 2-year guarantee **$145**

CAT MODEM Works same as Radio Shack Telephone Interface II **$148**

D-CAT HARD WIRED DIRECT MODEM **$189**

COMMUNICATIONS SOFTWARE

CCI-TELNET VERSION 5: A communication package which enables microcomputer users to communicate both with large mainframes and other microcomputers. Completely CP/M compatible. Multiple communication protocols supported. **$149**

INTELLIGENT TERMINAL SYSTEM ST-80 III: Enables a TRS-80* to act as a dial-up terminal on any time sharing network. **$139**

16K MEMORY UPGRADE KITS 2 for $65 $35

200 ns for TRS-80*, Apple II, (specify): **Jumpers $2.50**

PRINTERS



NEC Spinwriter

Letter Quality High Speed Printer

Includes TRS-80* interface software, quick change print fonts, 55 cps, bidirectional, high resolution plotting, graphing, proportional spacing: R.O. **$2395**

R.O. with Tractor Feed **$2575** KSR with Tractor Feed **$2950**

C.ITOH Starwriter, 25 CPS, daisy wheel printer **$1895**

C.ITOH Starwriter II, 45 CPS, daisy wheel printer **$2195**

Letter quality printers. Use up to 15" paper. 1 year warranty on parts. 3 months on labor. Proportional spacing and bidirectional printing. Same as VISTA V300.

779 CENTRONICS TRACTOR FEED PRINTER **$969**
Same as Radio Shack line printer I

737 CENTRONICS FRICTION & PIN FEED PRINTER **$795**
n × 9 proportional and 7 × 8 mono spacing.
Same as Radio Shack line printer IV

730 CENTRONICS FRICTION & PIN FEED PRINTER **$595**
7 × 7 matrix Same as Radio Shack line printer II

P1 CENTRONICS PRINTER Same as Radio Shack quick printer **$269**

PAPER TIGER (IP445) **$699**
(IP440) Includes 2K buffer and graphics option **$879**
(IP460) Bidirectional, 160 cps, graphics and 2K buffer **$1075**

TI-810 Faster than Radio Shack line printer III. Parallel and serial w/TRS-80* interface software w/u + I case & paper tray **$1589**
Compressed print, vertical form control **$1865**

OKIDATA Microline 80 Friction and pin feed **$545**
Tractor Feed, friction, and pin feed **$645**
Microline 82 Bidirectional, friction and pin feed **$745**
Microline 83 Bidirectional, 120 cps, uses up to 15" paper **$1050**

EATON LRC 7000 + 64 columns, plain paper **$289**

ANADEX DP-9500/01 $1350 **DP-8000 $795**

ACCESSORIES

HEAD CLEANING DISKETTE: Cleans drive Read/Write head in 30 seconds. Specify 5¼" or 8". **$20 ea/$45 for 3**

FLOPPY SAVER: Protection for center holes of 5¼" floppy disks. Installation tools and rings for 25 diskettes. **$ 11.95**
Re-orders of rings only $ 6.95

EXTERNAL DATA SEPARATOR: Eliminates data separation problems (crc). Improves reliability. This plug in unit comes fully assembled and tested. **$ 29.95**

Z-80 SOFTCARD: Your key to software expansion. The plug-in Z-80 Softcard transforms your Apple into a Z-80 while keeping all the benefits of the 6502. Comes with CP/M in two disk format, MBASIC and GBASIC, full documentation and utility programs. **$339**

RF MODULATOR: Adapts video to TV **$ 35.00**

TRS-80 & OTHER MYSTERIES **$ 18.95**

NEC SPINWRITER THIMBLE $11.95 **RIBBON $ 6.00**

CCS CARDS: Parallel or serial printer interface cards **$115.00**

RS232: For Radio Shack Interface. **$ 84.00**

TRS232: Teletype current loop output from cassette port **$ 49.00**

DISK-DRIVE EXTENDER CABLES: Fits all mini-disk drives. **$ 16.95**

SIX (6) PRONG ISOLATOR: ISO-2 **$ 54.00**

AC FILTER/6 PRONG POWER STRIP **$ 39.00**

DISK DRIVE CABLES: 2 drive **$29.00** 4 drive **$ 35.00**

DUST COVERS: TRS-80/Apple **$ 7.95**

PLASTIC DISKETTE HOLDER: For ring binder, holds 20 **$ 8.00**

For fast delivery, send certified checks, money orders or call to arrange direct bank wire transfers. Personal or company checks require two to three weeks to clear.

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED **Send for FREE Catalogue**

The CPU SHOP ✓256

TO ORDER CALL TOLL FREE 1-800-343-6522
TWX: 710-348-1796 Massachusetts Residents call 617/242-3361

5 Dexter Row, Dept. K01M
Charlestown, Massachusetts 02129
Hours 10AM-6PM (EST) Mon.-Fri. (Sat. till 5)

Massachusetts Residents add 5% Sales Tax
*TRS-80 is a Tandy Corporation Trademark
® Digital Research

master charge THE INTERBANK CARD

VISA

✓ Reader Service—see page 226

For about $10 you have your choice of reverse video—full-screen or fully programmable.

Reverse Video For the OSI C1P

By Donn Burke Baker

Reverse video—black characters on a white background—has several advantages.

For example, characters are often more distinct than with normal video, especially on inexpensive monitors or with systems that use a TV set and rf modulator.

Also, if the reverse function is programmable, areas of the display can be made to stand out dramatically for operator attention, to emphasize a critical figure, or simply to indicate that input is required.

Unfortunately, even full-screen reverse video is seldom available on small systems, and a programmable reverse video is usually found only on sophisticated systems or intelligent terminals.

An article in the December 1979 issue of *Microcomputing* ("Reverse Video from OSI's 540 Board") describes a simple method of obtaining full-screen reverse video for OSI's 540 video board. Upon examination of my C1P's manual, I discovered that, electrically, the circuits are identical (Ohio Scientific, 1978). The video output portion of the C1P display circuit is shown in Fig. 1. After reading the article, I jumpered the final video inverter (U70, pins 4, 5 and 6) with a miniature toggle switch brought out to the front panel.

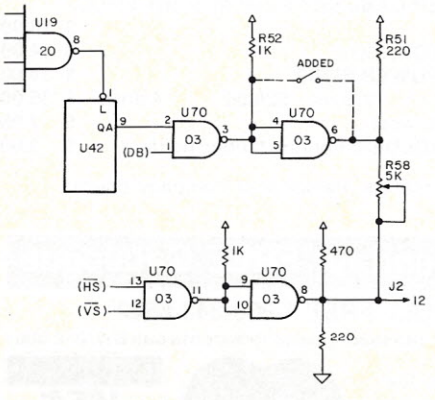


Fig. 1. Video output circuit—OSI C1P.

But my full-screen reverse video had one serious problem. I needed to adjust both the contrast and brightness controls of my monitor considerably for an acceptable quality. To make the matter worse, I couldn't adjust the monitor so that the quality of both the normal and reverse video displays were acceptable upon switching.

This set of hardware modifications for the Ohio Scientific C1P provides either a full-screen reverse video or fully programmable reverse-video display of high quality. The hardware costs are about $10.

Full-Screen Reverse Video

I found two flaws in the original method of obtaining reverse video. First, connection of the inverter output to its input (through the toggle switch) leaves that circuit open to high-frequency oscillations. Because of the fast switching time of the 74LS03 used as an inverter (typically less than 15 ns), a wire length to the switch of about 20 inches could allow oscillations. In turn, enough power could be drawn to damage the 74LS03, as well as cause interference with some radios and TVs.

The second problem is the change in video drive levels caused by paralleling R52 and R51 with the toggle switch. (See Fig. 1.) While you can compensate for this by adjusting R58, such adjustment precludes switching casually between normal and reverse modes of video display. It also prevents the point-by-point selection of normal or reverse video.

To restore the proper drive level, remove the possibility of high-frequency oscillation and permit programmable reverse video, I needed an electronic switch for the selection of reverse/normal video. Such a switch is the exclusive-OR (XOR) illustrated in Fig. 2a. While usually used in the logical design of circuits such as arithmetic adders, the XOR has the property of passing a signal or its complement, depending on the second, or control, input.

As can be seen from the truth table (Fig. 2b), input B can be thought of as the control signal, and input A as the desired signal. When B is logic 1 (reverse), then the complement of A is transferred to the output. When input B is logic 0 (normal), the A signal

Donn Burke Baker, 3128 Silver Lake Rd., Minneapolis, MN 55418.

is transferred unchanged.

Note that the circuit can be constructed from four two-input NAND gates. While XOR circuits can be purchased, I used discrete NAND gates. Only three gates are required since the fourth gate, the output, is the 74LS03 that is part of the C1P video output circuit. The other three gates are obtained by adding a 74LS00 to the prototype IC position at U44 on the C1P board. Fig. 2c shows the final implementation of the XOR in the C1P.

Photo 1 shows a portion of the C1P circuit board. IC position U44 is along the bottom edge, near center, just to the right of the crystal. U70 is located at the extreme left, along the bottom. Pin 1 of both ICs is toward the upper right of the photograph.

Install a 74LS00 at U44. A socket is not required, but recommended. The location has pin pads for a 16-pin IC, while the 74LS00 has only 14 pins. The pads closest to the crystal should be left unused. Be sure to install the IC (and socket, if used) with pin 1 toward the center of the board, like the other ICs in the row.

Locate U70, pins 3, 4 and 5. Note that all three are connected by small printed circuit (PC) runs between the pin pads. Pin 3 also has a PC run to R52.

Carefully cut the PC runs between pins 3 and 4 and between 4 and 5. (Do not disturb the PC run from pin 3 to R52.) Completely remove the cut runs from between the pin pads. (I recommend a new knife blade like X-acto for these operations.)

Connect the +5 volt bus (which runs across the top of position U44) to U44, pin 14, and the GND bus (running along the bottom of U44) to pin 7. Connect U70, pin 3, to U44, pins 1 and 13. Connect U70, pin 4, to U44, pin 11; and U70, pin 5, to U44, pin 6. Connect U44, pins 3, 4 and 12, together. All of these connections should be short and as direct as possible.

Connect U44, pins 2 and 5, together. If the programmable reverse video feature yet to be described will not be added, wire a toggle switch between U44, pin 2, and ground. The unused pin pads at the bottom of the location make good tie points for leads to the switch. If the programmable reverse video will be added, the switch is only temporary.

All soldering should be done with a fine-tip soldering iron. All added wires should be of 28 or 30 AWG gauge insulated wire. Also be careful not to strip too much insulation from the wire ends, since this can cause shorts between IC pins or PC runs. Be careful not to short pins and runs with solder bridges. Use solder very sparingly.

While some minor adjustment of contrast and brightness controls might be necessary, you should not need to make adjustments when switching between normal and reverse modes.

At this point, full-screen reverse video is available. Double-check all work and apply power if everything is OK. With the toggle switch closed (grounding U44, pins 2 and 5), a normal video display is produced. Opening the switch, letting U44, pins 2 and 5, go to +5, causes the video signal to be complemented by the XOR circuit, producing a quality reverse video display.

While some minor adjustment of contrast and brightness controls might be necessary, you should not need to make adjustments when switching between normal and reverse modes. No adjustment of R58 is required, if properly set in the first place.

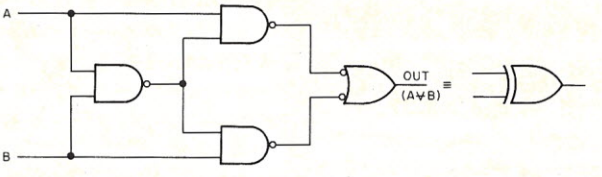
Programmable Reverse Video

Before going into the details of the programmable reverse video feature, I'll give a brief description of how the current video circuit works.

Like many microcomputer systems, the C1P uses a portion of its memory address space as a video display memory. Since the display on the C1P is 32 columns by 32 rows, 1024 addresses are required. The range of these addresses is D000–D3FF (hex) or 53248–54271 (decimal).

To display a character on the video display, place the eight-bit code for that character at the memory address location corresponding to the desired location on the display screen. This may be done by an STA instruction in 6502 assembly language or by a POKE in BASIC. Special address counters and multiplexers continuously present successive memory locations within the display memory address range to a ROM character generator. This generator translates the eight-bit code into the video signal necessary to control the monitor display. The video is amplified, combined with horizontal and vertical sync signals and sent to the monitor.

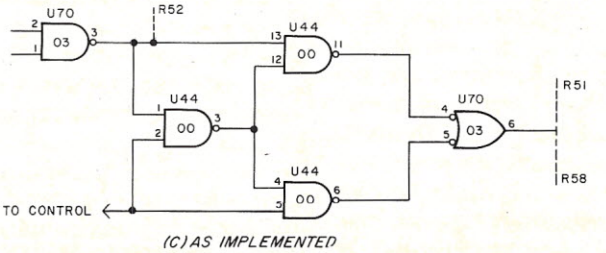
In designing the programmable reverse video, I decided that four requirements were to be met: any point, or combination of points, on



(A) EXCLUSIVE - OR

B	A	A⊻B
0	0	0
0	1	1
1	0	1
1	1	0

(B) TRUTH TABLE



(C) AS IMPLEMENTED

Fig. 2. Electronic reverse video switch.

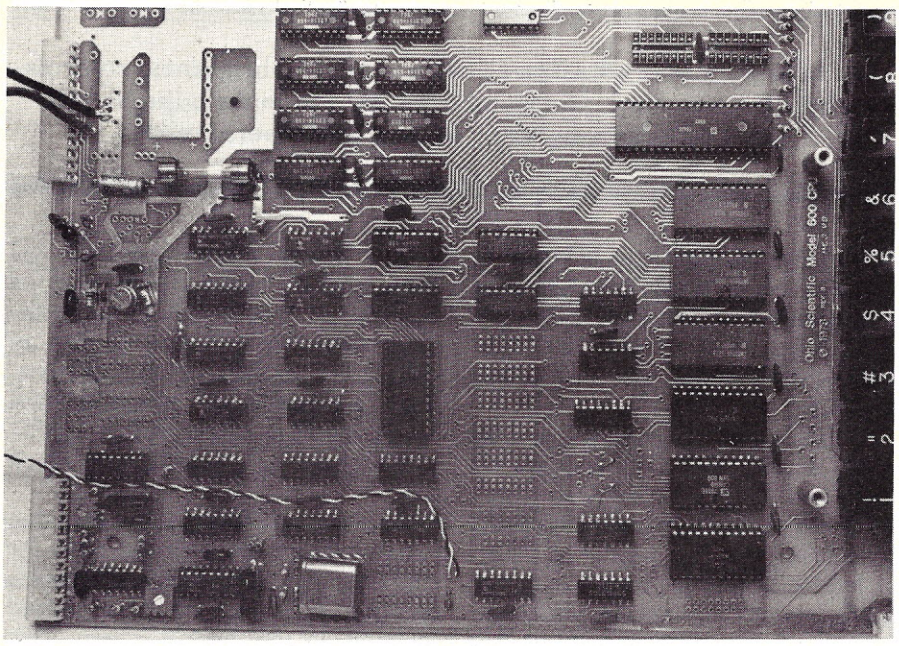


Photo 1. Portion of the C1P circuit board before modification.

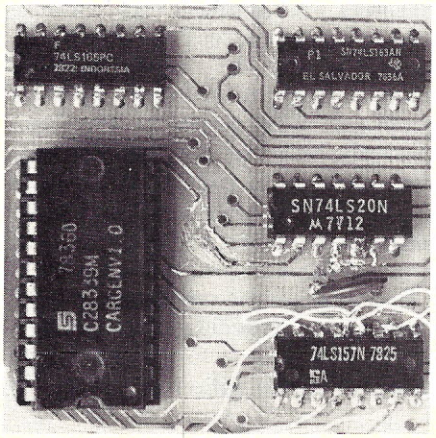


Photo 2. PC run from U56, pin 2, cut and removed.

the display must be programmable; the programming of a point should not be affected by a screen scroll; locating a point should be simple (i.e., the software necessary to program a point should be simple); and modifications required must be kept to a minimum.

By adding a one-bit-wide memory in an unused portion of the memory space, normal/reverse control information may be programmed in a manner identical to that used to place a character at any position within the display. The size of this memory is the same as the display memory, 1024 locations, and if located contiguously with the upper end of the present display memory, the added memory can be addressed by a simple offset of 1024 from the address of the character position.

The memory allocation map for the C1P calls out D000-D3FF (hex) as the video memory. The next location, however, is at DF00—the polled keyboard. Thus, D400- D7FF is currently unused, and is the size required for the added memory. This is true of all present configurations for the C1P: C1P; C1P-8K; C1P-MF, with P-DOS; and C1P-MF with OS56D. The use of D400-D7FF (hex) or 54272-55296 (decimal) allows any character to be displayed in reverse video by poking a control code for reverse display.

To implement this memory, you need some additional hardware. By modification and use of portions of existing hardware, the actual additional hardware is limited to a single memory IC (a 21L02) and a dual-D flip-flop (74LS74). Fig. 3 shows the added components, and also the use of various parts of the original circuit currently unused.

All necessary address decoding for the reverse/normal memory may be derived from currently existing signals, without the addition of extra logic elements. Recall that the added memory space starts where the present display memory ends. The range of addresses is D000-D3FF for the display, and D400-D7FF for the control memory. In terms of the address bus, these addresses are (A15·A14·$\overline{A13}$·A12·$\overline{A11}$·$\overline{A10}$·*(address within 1024 bytes as set by A9-A0)) and (A15·A14·$\overline{A13}$·A12·$\overline{A11}$·A10·(address within 1024 bytes set by A9-A0)). Note that only bit A10 changes, aside from the bits that select one-of-1024, bits A9-A0.

The high-order three bits of address (A15, A14, A13) are decoded by U23, a three-to-eight line decoder. The output corresponding to A15·A14·$\overline{A13}$ (named ($\overline{V}$) in OSI's documentation) is used as one input to a four-input NAND at U56. The remaining inputs of U56 are A12, $\overline{A11}$ and $\overline{A10}$. Output of this gate (named ($\overline{VA}$)) switches the address lines of the display memory between the refresh counter and the memory bus.

It is obvious that address line A10 has become a "don't care." That is, since it assumes both the true and not true states for the address multiplexer, it may be omitted. This is done by simply removing $\overline{A10}$ from the input of the NAND gate at U56 (see Fig. 3). Carefully cut and remove a short section of the PC run to U56, pin 2, near the top of the IC location. Photo 2 shows the PC run cut away.

A memory enable ($\overline{CE}$) is developed from Ø2 and GND, selected by an unused portion of the address multiplexer, U55. Using a short jumper, connect U55, pin 13, to GND. Wire U55, pins 11 and 14, together. Connect U55, pin 12, to U28, pin 13, with a short, direct wire.

Install a 21L02 at U28. A socket is recommended. Wire U28, pin 10, to +5 and U28, pin 9, to GND.

The R/$\overline{W}$ signal for the added mem-

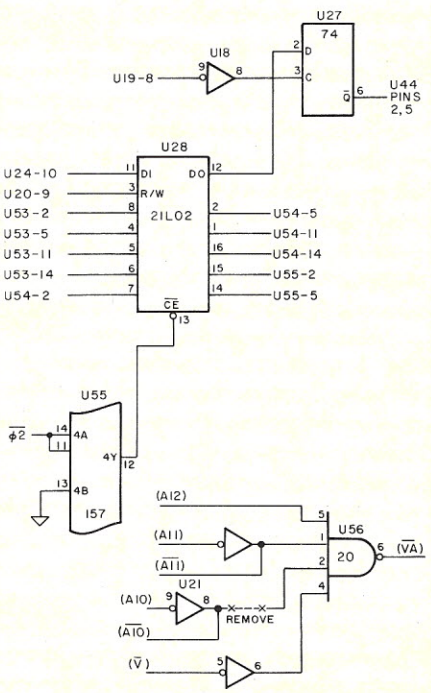


Fig. 3. Programmable reverse video switch.

**The centered dot is the symbol for the logic operation AND.—Editors.*

MODEL II



$ DISCOUNT $

TRS-80® DEALER

MODEL III



COMPUTER SPECIALISTS

26-4002
64K 1 Drive
$3440.00

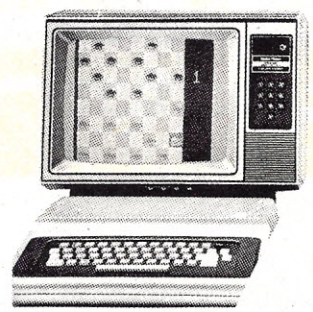
26-4160 1 Drive EXP	$1035.00
26-4161 2 Drive EXP	1575.00
26-4162 3 Drive EXP	2115.00
26-4501 Gen. Ledger	180.00
26-4502 Inventory	180.00
26-4503 Payroll	360.00
26-4554 Acct. Rec.	180.00
26-4701 Fortran	270.00
26-1157A Daisy Wheel	2495.00
26-1158 Daisy Wheel II	1799.00

26-1155 Quick Printer II	$187.00
26-1145 RS-232 Board	84.00
26-1140 "O" K Interface	249.00
26-1141 "16" K Interface	359.00
26-1142 "32" K Interface	469.00
26-1160 Mini Disk - Drive O	419.00
26-1161 Mini Disk - Additional	419.00
26-1154 Lineprinter II	699.00
26-1156 Lineprinter III	1799.00
26-1159 Lineprinter IV	859.00
26-1166 Line Printer VI	1080.00
26-1563 Scripsit - Disk	79.00
26-1566 Visicalc	83.00
26-1562 Profile	72.00

NOTE: Call for availability of VIDEO TEX, Model III, Color, and other new products.

26-1061 4K I	$630.00
26-1062 16K III	888.00
26-1063 32K III 2-Drives, RS232	2225.00

COLOR



26-3001 4K	$360.00
26-3002 16K	540.00
26-3010 Color Video	360.00
26-1206 Recorder	54.00
26-3008 Joysticks	22.50



ALL OTHER R.S. SOFTWARE FURNITURE, STANDS, CABLES AND ACCESSORIES AT DISCOUNT FROM CATALOG PRICE.

CENTRONICS

Fast 100 CPS Centronics
730 Printer $659.00
Text Quality Centronics
737 Printer $819.00

Novation Cat Modem .. $149.00
CCA Data Management System 72.00
Adventure Games Games 1-9 each 14.00

Pocket Computer



26-3501 1.9K P.C.	$225.00
26-3503 Cassette I/F	45.00
14-812 Recorder	72.00

Model II Cobol Compiler $360.00
Cobol Run Time Package $36.00

Acorn Software Products, Inc.

GAMES:	
Alien Invasion	$9.00
Stock Market	9.00
Star Trek	9.00
Block 'Em	9.00
Ting-Tong	9.00
UTILITIES:	
System Savers	14.00
EDUCATION:	
Language Teacher	18.00

FREE: COMPUTER CATALOG UPON REQUEST

1-800-841-0860 Toll Free Order Entry

MICRO MANAGEMENT SYSTEMS, INC. 100

No Taxes on Out Of State Shipments

Immediate Shipment From Stock on Most Items

DOWNTOWN PLAZA SHOPPING CENTER
115 C SECOND AVE. S.W.
CAIRO, GEORGIA 31728
(912) 377-7120 Ga. Phone No.

R.S. 90 Day Limited Warranty
F-48 Form Provided

Largest Inventory In the S.E. U.S.A.

*TRS-80 is a registered trademark of the Tandy Corp.

Reader Service—see page 226

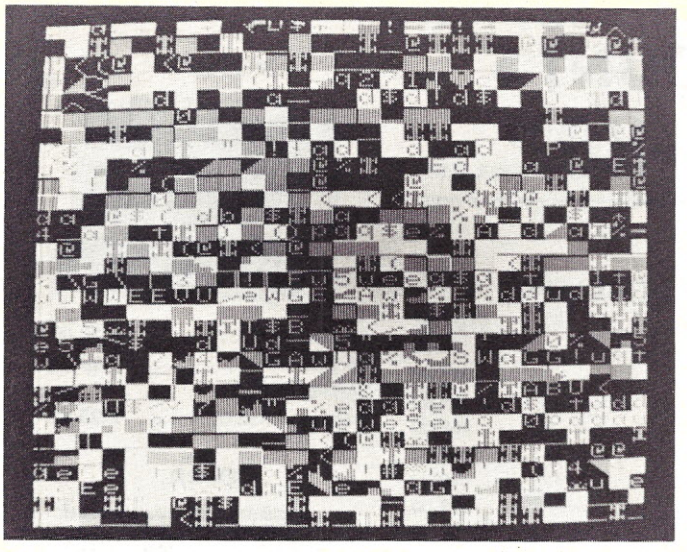


Photo 4a. A "power on" screen pattern. Note randomness of reverse video squares with this 21L02 memory.

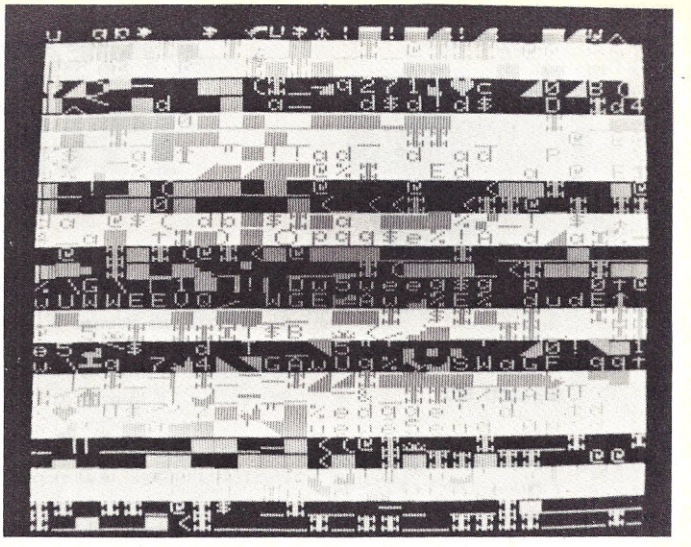


Photo 4b. Another "power on" screen pattern. With this 21L02, bands of reverse video are placed on the screen.

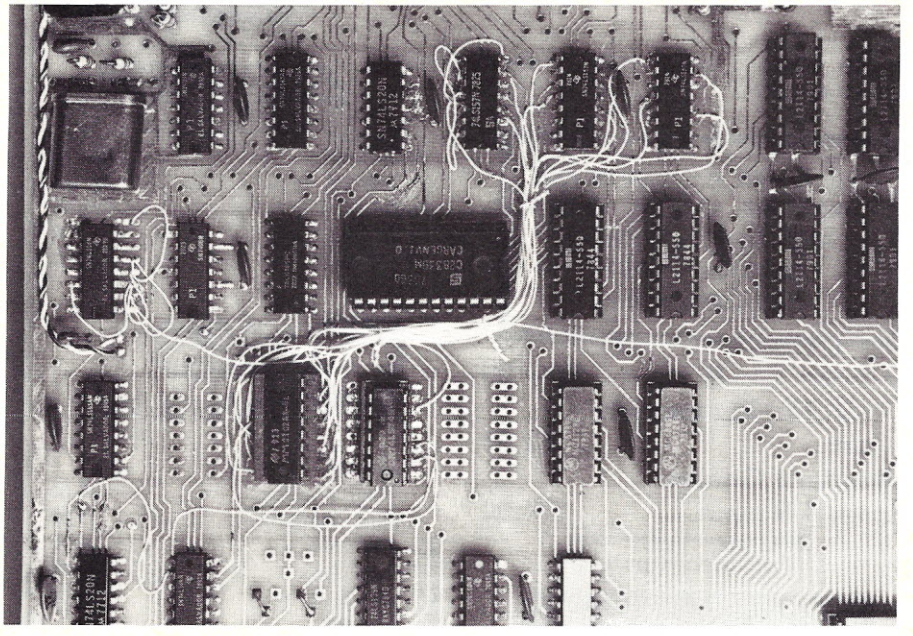


Photo 3. Completed programmable reverse video modifications. Note added ICs at U44, U27 and U28.



Photo 4c. Display response to "BREAK" keyin.

ory is taken from the decoder at U20 corresponding to an address greater than D3FF but less than D7FF (A15·A14·$\overline{A13}$·A12·$\overline{A11}$·A10). Using a short, direct wire, connect U20, pin 9, to U28, pin 3.

The data input signal for the added memory is taken directly from the data bus, bit 0. Connect U24, pin 10, to U28, pin 11.

The low-order ten bits of address, necessary to select one byte of 1024, are taken from the address multiplexers (U53, U54 and U55). These are controlled by the output of U56 ($\overline{VA}$). The address bits are wired from the input side of the multiplexer. Connect U53, pin 2, to U28, pin 8; U53, pin 5, to U28, pin 4; U53, pin 11, to U28, pin 5; and U53, pin 14, to U28, pin 6. Connect U54, pin 2, to U28, pin 7; U54, pin 5, to U28, pin 2; U54, pin 11, to U28, pin 1; and U54, pin 14, to U28, pin 16. Connect U55, pin 2, to U28, pin 15; and U55, pin 5, to U28, pin 9. Although lead dress is not critical, it will help to keep the added wires short and neatly dressed.

The last part of the modification is the type-D flip-flop shown in Fig. 3. This flip-flop serves to hold the reverse/normal control signal while the display is being generated. It also synchronizes the presentation of the reverse/normal control and character data being displayed.

Install the 74LS74 at U27. Again, a socket is recommended. Be sure to install pin 1 toward the center of the board and leave the bottom pin pads unused. Wire +5 and GND to pins 14 and 7, respectively. Connect U28, pin 12, to U27, pin 2.

The $\overline{Q}$ output of the flip-flop, U27, pin 6, is wired to the XOR circuit in place of the toggle switch used earlier. Disconnect the toggle switch from U44, pin 2, and wire U27, pin 6, to U44, pin 2, instead.

(The toggle switch may be left in the circuit. This would provide a full-screen reverse-video display (switch closed) or a programmable display (switch open).)

Only one control signal is needed for the flip-flop: a clock. This signal exists already to load the character generator signal into the serial shift register at U42. However, this signal is of the wrong polarity.

An inversion is required, or the reverse/normal control will be applied to the XOR one display column too

```
D/C/W/M ?
MEMORY SIZE?
TERMINAL WIDTH?

 7423 BYTES FREE

OSI 6502 BASIC VERSION 1
0 REV 3.2
COPYRIGHT 1977 BY MICROS
OFT CO.

OK
10INPUT "BACKGROUND"; BK

20FORI=0TO1023
30POKE 54272+I,BK
40NEXT
RUN
BACKGROUND? 0

OK
-
```

Photo 5b. Result of running the Checkout program for a "normal" display.

```
D/C/W/M ?
MEMORY SIZE?
TERMINAL WIDTH?

 7423 BYTES FREE

OSI 6502 BASIC VERSION 1
0 REV 3.2
COPYRIGHT 1977 BY MICROS
OFT CO.

OK
10INPUT "BACKGROUND"; BK

20FORI=0TO1023
30POKE 54272+I,BK
40NEXT
RUN
BACKGROUND? 0

OK
RUN
BACKGROUND? 1

OK
```

Photo 5c. Result of running Checkout program for "reverse video" display.

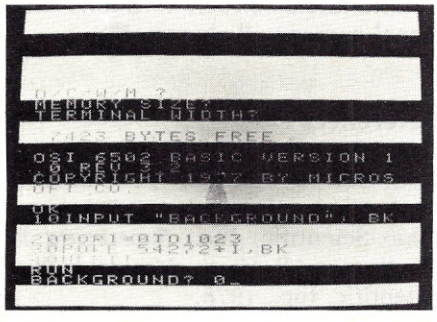


Photo 5a. Checkout program (Listing 1) keyed in for a "normal" display (BK = 0).

late. This results in an incorrectly displayed character. Fortunately, an unused inverter is located at U18, pins 9 (input) and 8 (output). Wire U19, pin 8, to U18, pin 9. Wire U18, pin 8, to U27, pin 3.

Sound engineering practice would require the use of a pull-up resistor to terminate two unused inputs on the 74LS74, and also one on the NAND gate at U56. I found it unnecessary with the circuits used, but if you want, add a 1k, ¼-watt resistor between the unused pin pads at the bottom of U27. Connect the pin pad beside pin 8 to +5. Connect the pin pad beside pin 7 to U27, pins 4 and 1. Also, connect the pin pad beside U27, pin 7, to U56, pin 2.

Photo 3 shows the completed modifications. Except as noted, wire dress is not critical. Several of the wires were placed on the bottom, or wire, side of the circuit board to allow for short, direct runs.

Operation of Modified Video

When you first turn the monitor on, the video display will show the usual random characters, as well as some characters displayed in reverse video. Photos 4a and 4b show this display with two different 21L02 memories at power-up time. Either display is correct. Pressing the break key will clear the characters from the screen but will not alter the black/white pattern of the reverse video. See Photo 4c.

If you have left the toggle switch from the first part of the conversion in the circuit, make sure that it is in the open position. Otherwise, it will be impossible to produce a programmable display.

Bring the system up in BASIC and enter the short program shown in Listing 1 to check out the modification. Run the program, entering 0 when prompted. As the program executes, the screen will be progressively turned black. When the system responds with "OK," execute the program a second time, answering the prompt with "1." Now the screen background will be turned white, thereby displaying any characters in reverse video. Photo 5 (a-c) illustrates this checkout program.

While 0 and 1 were used to indicate normal and reverse video, respectively, any even integer would have produced a normal display; any odd integer would have produced a reverse display. This is because only the least significant digit (D0) of the data bus is stored as a control.

A one-line "program" that will set the video mode is as follows:

```
FOR I=0 TO 1023:POKE 54272+I,0:NEXT
```

Executed in command mode—that is, without a line number—this will set the entire screen to either normal or reverse video (poke a 1 for reverse, a 0 for normal). It is especially useful for setting the screen at power-up time.

Programmable reverse video for highlighting text blocks is quite simple: Simply poke into (character display address + 1024) the appropriate code, 0 or 1. As a simple example, Photo 6 shows a single line in reverse video across the bottom of the screen. This is the cursor line in BASIC, where all input is first placed onto the screen. The line's first display location is 54115 (decimal) and is programmed to reverse by poking 54115 + 1024 to 54139 + 1024 with a 1.

The display of a character, or string of characters, can be made dynamically as well. Since relational operators return either a Ø (false) or a 1 (true) value, a program can easily determine when to highlight an area of

```
10 INPUT "BACKGROUND";BK
20 FOR I=Ø TO 1Ø23
30 POKE 54272+I,BK
40 NEXT
```

Listing 1. Reverse Video Checkout program. BK = 0 yields normal video; BK = 1 yields reverse video.

```
-- -------------
-- ER=(BAL<Ø)
-- FOR I=1 TO LEN(STR$(BAL))
-- POKE XXXXX+I,ASC(MID$(BAL),I,1)
-- POKE XXXXX+I+1Ø23,(ER AND 1)
-- -----------
```

Listing 2. Program segment to highlight a character string.

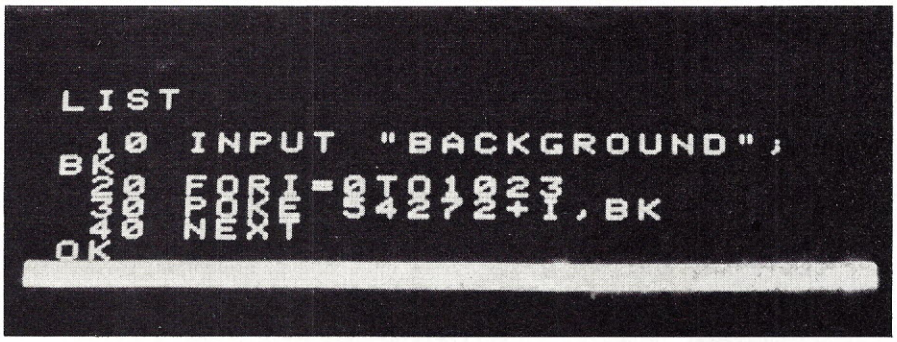


Photo 6. Using reverse video to highlight the cursor line in BASIC.

the display. For example, if your checkbook balance drops below zero, the balance is displayed and highlighted in reverse video. The program segment in Listing 2 illustrates this.

Problems

Two minor problems exist with this implementation of programmable reverse video. While neither is serious, they require mention. In general, they will not affect the utility of the reverse video in operation.

First, you cannot read (peek) the reverse video control memory to determine the state of the control bit for various locations. To add such capability would require another integrated circuit and additional wiring.

The second problem may be a bit more annoying, and exists whenever the screen is programmed into text blocks of reverse video. When the return key is pressed or the screen scrolls, a series of short horizontal bars is flashed onto the screen. These make reading the screen difficult for the instant that they appear, but fortunately exist only for an instant. Since the screen would normally be read while static, this poses no serious problem.

Conclusion

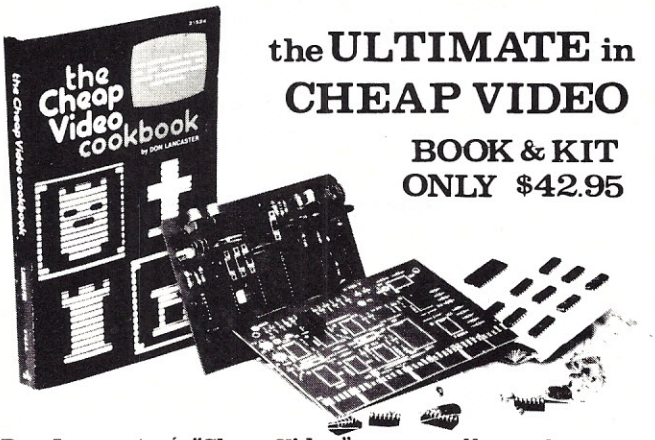
Two methods of providing the OSI C1P with reverse video displays have been detailed. Both methods provide high-quality displays that may be selected without requiring adjustment of the video output circuit or monitor. The first allows only full-screen normal or reverse video. The second permits a point-by-point selection of normal or reverse video of the entire 32 by 32 display screen. Changes and additions to the C1P are kept to a minimum. The total cost of the modifications should not exceed $10.

These approaches to reverse video are easily adaptable to other OSI products, such as the 540 video board. If you try this, remember that pin numbers, circuit locations and signal names will change. ■

References

Lary, Richard A., "Reverse Video from OSI's 540 Board," *Kilobaud Microcomputing* (December 1979).

Ohio Scientific, Inc., *Superboard II Challenger 1P User's Manual*, Ohio Scientific, Inc., 1978.



the ULTIMATE in CHEAP VIDEO

BOOK & KIT ONLY $42.95

Don Lancaster's "Cheap Video" concept allows almost unlimited options, including:

* **Scrolling · Full performance cursor.**
* **Line/Character formats of 16/32, 24/80, 32/64 .... or almost anything.**
* **Graphics - up to 256 X 256 B&W; 96 X 128 COLOR (requires low-cost option modules)**
* **Works with 6502, 6800 and other micros.**

SPECIAL OFFER: Buy the Kit (upper case alpha-numeric option included) & get the Book at 1/2 price.

✓106 PAIA ELECTRONICS, DEPT. K, 1020 W. WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

I'm Sold, PLEASE RUSH..... ( ) SEND FREE CATALOG

( ) TVT-6 5/8 Kit & Cheap Video Cookbook $42.95

( ) TVT-6 5/8 Kit only (book required for assembly) - $39.95

name:_____

address:_____

city:_____ state:_____ zip:_____

PAIA ELECTRONICS, Dept. K 1 1020 WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

COMP CASE



ATTACHE STYLE CASES FOR CARRYING AND PROTECTING A COMPLETE COMPUTER SET-UP. CONSTRUCTED OF THE HIGHEST QUALITY LUGGAGE MATERIAL WITH SADDLE STITCHING WILL ACCOMMODATE EQUIPMENT IN A FULLY OPERATIONAL CONFIGURATION ALONG WITH MANUALS, WORKING PAPERS AND DISKS. NEVER A NEED TO REMOVE EQUIPMENT FROM CASE. SIMPLY REMOVE LID, CONNECT POWER AND OPERATE. LID CAN BE REPLACED AND LOCKED FOR SECURITY AND PROTECTION WITHOUT DISCONNECTING CABLES. FULLY TESTED.

- **AP101S Apple and Single Disk Drive $109**
- **AP102D Apple and Double Disk Drive 119**
- **AP103M Apple, 9 inch Monitor and Double Drive 129**
- **RS201 TRS-80, Expansion Unit and Double Drive 109**
- **RS202 TRS-80 Monitor and Accessories 84**
- **P401 Paper Tiger Printer 99**
- **P402 Line Printer II-Centronics 730 ..... 89**
- **CC90 Matching Attache Case 75**

master charge VISA®

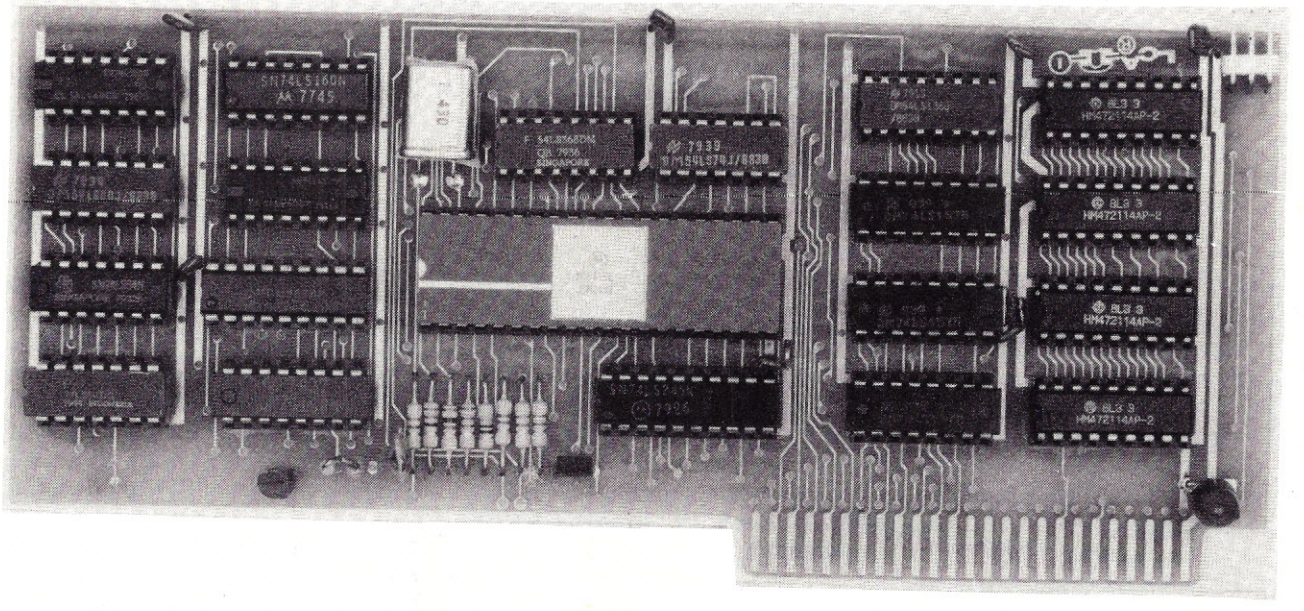
COMPUTER CASE COMPANY ✓320

5650 INDIANA MOUND CT. COLUMBUS, OHIO 43213

(614) 868-9464

FOR APPLE II AND APPLE II PLUS COMPUTERS

DoubleVision™



80 x 24 Video Display with Upper and Lower Case

COLUMNS LINES

• is a hardware board that may be plugged into any slot in Apple II or Apple II Plus 32K or 48K Disks • full 128 ASCII character set, including control characters • fully programmable cursor • built in light pen capability • inverse video • full cursor control • works with 50/60Hz • has 2k of its own screen memory • has its own video output jack that must be connected to a monitor (or a high band width black & white TV thru a good RF modulator). Color TV's produce a poor display and are not recommended. • permits you to connect another monitor (or a T.V. set thru RFmod) to the Apple video output jack • displays 24 lines of 80 column text — programmable for different values • permits you to have graphics on Apple video output • video output and Apple video output may be connected to one monitor thru optional video switch • is active only when addressed for reading from or writing to • accepts lower case input from keyboard by use of escape key. (no modification required) or direct use of shift key (1-wire connection from shift key pad to DoubleVision required). • is compatible with the latest version of various word processing software packages. Presently these include Apple-pie 2.0— Programma International, Easywriter Professional system—Informational Unlimited, Text Editor/Formatter—Peripheral's Unltd. (when ordering from these companies, please ask for versions compatible with DoubleVision). All software available from Computer Stop when released. • Peripheral's Unltd. B.I.T.S. and P.I.T.S. and Southeastern Software's "DATA CAPTURE" with Micromodem and communication card. These packages give ability to upload, transfer and download files from remote computers, and all at 80 columns! • Programma Int. latest assembler LISA V:20 will support full 80 column display • is transparent for use with Basic and Pascal • software on disk for easy modification and adaptation for different applications • completely commented source listing of software and hardware schematics available • PASCAL (optional) • becomes the console when installed in Pascal • Permits 80 column text processing with full upper/lower case while using Pascal's editor • must be plugged into slot 3 when operating with Pascal

Available now at your local computer store. $295.00

Call Computer Stop for Store nearest you

Shipping, Insurance, Handling, extra

Calif. Residents add 6% Sales Tax

*Apple is a Registered TM of Apple Computers, Inc.

Dealer inquiries invited.
Contact:

COMPUTER STOP CORP.
2545 West 237th St.
Suite L
Torrance, CA 90505
539-7671

The Computer Stop
16919 Hawthorne Blvd.
Lawndale, CA 90260 ✓283
(213) 371-4010

MON. - SAT.
10-6

Boot up your system and go directly to the program of your choice. Save time and keystrokes.

For CP/M: Automatic Program Execution on Start-up

By Jon Lindsay

Digital Research's CP/M operating system is a powerful adjuvant to the power of the personal computer. So it was with some excitement that I read an article on "turnkey" CP/M systems in *Creative Computing* (December 1979). But the author's description of an assembly-language program, which made his system operate like the "big" systems by allowing single key program selection on start-up, somehow detracted from another excellent section of the article where he described the technique for making CP/M *automatically* execute a preselected program after reset. I will further describe this technique and give some examples as to how to do it.

With this technique, after you boot up your system (either with a reset or through a monitor and a G + address command), CP/M will sign on in the usual manner and then continue to execute a program of your choice. This program can be anything that you could normally type in and execute in the normal system after the prompt A> is given.

Thus, if you want to have the directory (normally a .COM type command) executed, you may. Or perhaps because of the personnel using your system, you want the machine to come up running BASIC and some selected program such as a MENU, which in itself may allow further BASIC-type program selection. This is now possible.

For an understanding of exactly how CP/M works, see the CP/M reference manuals.

CP/M Modification

When CP/M signs on and gives an A> prompt, any command you type on the screen at that time is entered into a command buffer. The command string is counted and also placed in the same area. The command is executed and the count goes to zero.

After you execute a boot-up of CP/M, but before the A> prompt appears, CP/M looks at the command buffer to see what's there. If the count is zero, it prints the A> prompt and waits for something to be entered. The trick here is to place a command into this area so that after a reset, CP/M will find a command in the command buffer, just waiting for execution. This is relatively easy to accomplish.

During normal CP/M operation, the command buffer area resides in high memory, along with the rest of your CBIOS. However, you need to get to that area as it is being loaded into high memory. Catching it hot off the disk is the best way. Since this area (and the rest of CP/M) is resident on tracks 0 and 1 of a CP/M disk, you must first bring CP/M off the disk and into memory so that it may be saved. Then a DDT operation may be performed on it. Later you will put it all back on the disk.

I assume that you have a correctly running CP/M system. The exact location of the data you are seeking will vary from system to system because of minor modifications to CP/M or bootstrapping necessary to a particular system. I use an ICOM disk system that requires an extra bootstrap program. This throws off the "standard" offset. But as it turns out, there should not be any problem in locating the data area sought. But more about that later.

Cookbooking

First you must get CP/M off the disk and into memory. Do this with the SYSGEN command. The sequence of events is shown in Listing 1.

What you've done is brought CP/M into memory and saved it. Next you must examine it and locate the required command buffer. One of the excellent utilities that comes with CP/M is DDT (Dynamic Debugging Tool). The plan now is to load CP/M back into memory with DDT and operate on it. This is accomplished by typing

A>DDT CPM.COM

```
    type SYSGEN
CP/M responds with:
    SYSGEN VER 1.4
    SOURCE DRIVE NAME (OR RETURN TO SKIP)A (You type the A)
    SOURCE ON A, THEN TYPE RETURN (hit RETURN)
    FUNCTION COMPLETE
    DESTINATION DRIVE NAME (OR RETURN TO REBOOT) (hit RETURN)
Now you will see the prompt A> again. Type
    A>SAVE 32 CPM.COM (Note: if you have version 2.0 of CP/M, use 35 instead of 32)
```

Listing 1.

Jon Lindsay, 3812 N. First St., Fresno, CA 93726.

```
-D0A00
0A00 C3 55 AC C3 51 AC 7F 00 20 20 20 20 20 20 20 20 .U..Q...
0A10 20 20 20 20 20 20 20 20 43 4F 50 59 52 49 47 48         COPYRIGH
0A20 54 20 28 43 29 20 31 39 37 38 2C 20 44 49 47 49 T (C) 1978, DIGI
0A30 54 41 4C 20 52 45 53 45 41 52 43 48 20 20 00 00 TAL RESEARCH  ..
0A40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A50 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A80 00 00 00 00 00 00 00 00 08 A9 00 00 5F 0E 02 C3 ............_...
0A90 05 00 C5 CD 8C A9 C1 C9 3E 0D CD 8C A9 3E 0A C3 ........>....>..
0AA0 8C A9 C5 CD 98 A9 E1 7E B7 C8 23 E5 CD 8C A9 E1 .......~..#.....
0AB0 C3 A7 A9 0E 0D C3 05 00 5F 0E 0E C3 05 00 0E 0F ........_.......
```

Listing 2.

CP/M responds with

```
DDT VERS 1.4
NEXT  PC
2100 0100
```

Now, using the commands of DDT, you can locate and change or add data as you choose. Rather than perhaps confuse you with a calculation as to your particular CP/M offset, it is far easier to just look for the area in question. In my system (ICOM), I found it starting at location 0A00H. On a North Star five-inch disk system, I found it at 0900H. In theory, I believe it may be located in the "standard" edition at location 0980H.

But no matter. Look at Listing 2 for the major clue. You are looking for the copyright inscription of Digital Research. It should be roughly in the range suggested above. Once you have found it, the rest are all the same. I might add at this point that you can do this same thing with version 2.0 of CP/M as you can with version 1.4. Using my case as an example, use the D command and type

```
-D0A00
```

That which you see in Listing 2 should appear on the screen. In particular, note the line just preceding the copyright start line—(0A00). This is the one that we will operate on. There may be some differences on this line. The underlined portion of the line will vary as to your system size.

```
0A00 C3 55 AC C3 51 AC 7F 00
20 20 20 20 20 20 20 20  .U..Q...
```

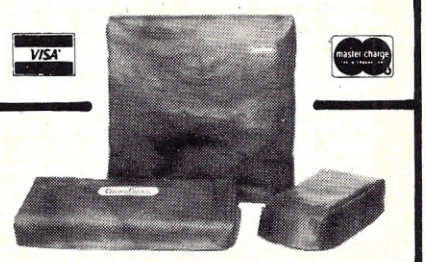
Now you are ready to enter the hexadecimal values of the command you have selected. For example, if you want to have the directory activated on start-up, you could name it DIR. Therefore, the hex code to be entered would be 44 49 52. Any other .COM file would work as well. It is not necessary to enter ".COM" as code since this is already understood.

In Listing 2, looking at line 0A00, make a note of the 7F at location 0A06. This represents the maximum length of the command buffer. The following byte at location 0A07 is the length of the command string, or the character count. If this byte is zero (00), then CP/M on sign-on will think no command exists and will issue the prompt A>, waiting for a command. While it apparently does not have to be this exact length of the string (any nonzero number will do), it is easy to count the number of bytes of your "command" and insert this number (in hexadecimal equivalent) into this location. Starting at location 0A08, enter the command in hex. The byte immediately after the last byte of your command *must* be a zero (00). Assuming that this is done, you should be able to type the D command again and demonstrate that the

```
-D0A00
0A00 C3 55 AC C3 51 AC 7F 03 44 49 52 00 20 20 20 20 .U..Q...DIR.
0A10 20 20 20 20 20 20 20 20 43 4F 50 59 52 49 47 48         COPYRIGH
0A20 54 20 28 43 29 20 31 39 37 38 2C 20 44 49 47 49 T (C) 1978, DIGI
0A30 54 41 4C 20 52 45 53 45 41 52 43 48 20 20 00 00 TAL RESEARCH  ..
0A40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A50 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A80 00 00 00 00 00 00 00 00 08 A9 00 00 5F 0E 02 C3 ............_...
0A90 05 00 C5 CD 8C A9 C1 C9 3E 0D CD 8C A9 3E 0A C3 ........>....>..
0AA0 8C A9 C5 CD 98 A9 E1 7E B7 C8 23 E5 CD 8C A9 E1 .......~..#.....
0AB0 C3 A7 A9 0E 0D C3 05 00 5F 0E 0E C3 05 00 0E 0F ........_.......
```

Listing 3.

CompuCover®



COVER YOUR INVESTMENT

- Cloth Backed Naugalhyde Vinyl
- Waterproof & Dustproof
- Longer Life
- Improved Reliability
- Two Decorator Colors— Saddle Tan and Black

APPLE COMPUTERS
Apple Ensemble - covers entire Apple II with 9" video & two stacked disk ..$15.95
Full Apple II ..12.95
Apple II Keyboard ..7.95
Apple II Disk ..3.95
Apple II Disk (stacked-two disk) ..7.95
APPLE III available soon

TRS-80 MODEL I
Keyboard ..$ 7.95
Cassette ..4.95
Video Display ..9.95*
Package Offer ..18.95*
*NOTE-Add $3.00 for Expansion Interface
TRS-80 5¼" Disk ..$ 4.95
Two Disk Cover (side by side) ..7.95

TRS-80 MODEL II
Entire Unit ..$22.95
Keyboard Only ..7.95
Three Disk Unit (8" Drives) ..18.95

TRS-80 MODEL III ..$14.95

TRS-80 COLOR COMPUTER ..9.95
Line Printer I ..$16.95
Line Printer II ..9.95
Line Printer III ..15.95
Line Printer IV ..9.95
Line Printer VI ..14.95
Daisy Wheel Printer II ..16.95
Quick Printer I ..9.95
Quick Printer II ..5.95

PET COMPUTERS
Pet 2001 ..$12.95
Pet 8032 ..12.95
Pet 2040 Disk ..12.95
Pet 2022 Printer ..9.95
Pet 2023 Printer ..7.95

ATARI 800 ..$10.95
Atari 400 ..9.95
Atari 810 Disk ..5.95

CROMEMCO System Three ..$19.95
Cromemco 3100 CRT ..18.95
Cromemco 3779 Printer ..16.95
Cromemco 3703 Printer ..18.95

SUPERBRAIN ..$19.95
Emulator ..19.95
Intertube ..19.95
Superstar ..19.95

HEATH COMPANY
H-19, H-89 CRT ..$18.95
H-17 Disk ..9.95
H-27 Disk ..12.95
H-77 Disk ..9.95
H-8, H-11 Computers ..12.95
H-14 Printer ..9.95
H-34 Printer ..15.95
H-36 Printer ..18.95

DIGITAL ELECTRONICS
Data System Terminal ..$19.95
Decscope Terminal ..19.95
WT/78 Terminal ..19.95
VT/78 Terminal ..19.95
VT-100 Terminal ..16.95
Decprinter I ..15.95
Decwriter II ..18.95
Decwriter III ..18.95
Decwriter IV ..15.95

OHIO SCIENTIFIC
C1P Computer with Keyboard ..$14.95
C4P Computer with Keyboard ..14.95
C2D Computer ..19.95
C3D Computer ..19.95
C2 OEM Computer ..19.95
C3 OEM Computer ..19.95
C3-S1 Computer (single) ..16.95
C3-S1 Computer (stacked) ..22.95

WANG COMPUTERS
Terminal with disk ..$20.95
Terminal without disk ..18.95
2221 Printer ..19.95
2221-W Printer ..22.95
2231 Printer ..19.95
2261 Printer ..19.95
CPT 8000 Computer ..$22.95
CPT Rotary IV Printer ..12.95
CPT Rotary V Printer ..15.95
Compucolor II Entire Unit ..$16.95
Compucolor II Keyboard ..5.95
Vector Graphic MZ Computer ..$14.95
Vector Graphic Mindless Terminal ..18.95
North Star Horizon ..$14.95
Hewlett Packard 85 ..14.95
Sorcerer ..9.95
Texas Instruments 99/4 ..9.95
Intercolor 3621 ..18.95
PolyMorphic System 8813 Computer ..14.95
PolyMorphic Keyboard ..7.95

CRT's
Televideo TV1 912 or 920 ..$14.95
Hazeltine (one size fits all) ..18.95
Soroc IQ 120 ..18.95
Adds Terminals 25, 100, 980, etc ..19.95
ADM-3 ..14.95
Leedex Video 100 ..9.95
Leedex Video 100-80 ..12.95

PRINTERS
NEC Spinwriter with Keyboard ..$15.95
NEC Spinwriter without Keyboard ..15.95
Diablo with Keyboard ..15.95
Diablo without Keyboard ..15.95
Xerox with Keyboard ..15.95
Xerox without Keyboard ..15.95
Qume Sprint III ..14.95
Qume Sprint V with Keyboard ..15.95
Qume Sprint V without Keyboard ..15.95
Teletype 43 ..12.95
IDS 440 Paper Tiger ..12.95
Texas Instruments 800 Series ..18.95
Trendcom 100 or 200 ..9.95
Centronics 101 ..19.95
700, 701, 702, 703, 704, 753 ..18.95
Centronics 779 ..16.95
Centronics P1, 730, 737 ..9.95
Comprint 912 ..12.95
Anadex DP8000 ..12.95
Xymec HY Q 1000 ..12.95
Okidata 22 ..15.95
Okidata SL125 ..15.95
Okidata SL250 ..15.95

DISK DRIVES
Micropolis 1041, 1042, 1043, 1053 ..$ 9.95
Vista Double Disk ..9.95
Vista 5¼" Disk ..6.95
Matchless 5¼" Disk ..6.95
Lobo Double 8" Disk ..9.95
Lobo 5¼" Disk ..6.95
MPI 851 or 852 Disk ..4.95
Percom 5¼" Disk ..4.95

MINI's and MAXIE's
IBM 3610 Printer ..$12.95
IBM 3604 Keyboard ..9.95
IBM 3610 and 3604 Ensemble ..15.95
IBM 5120 Computer ..22.95
IBM 5103 Printer ..19.95
IBM 3276 ..22.95
IBM 3278 ..22.95
IBM 5251 (crt & keyboard) ..22.95
IBM 5251 Keyboard ..9.95

DATA GENERAL
Dasher LP2 ..$15.95
Dasher TP1 ..15.95
Dasher TP2 ..15.95
Dasher D100 ..19.95
Dasher D200 ..19.95
6052 CRT and Keyboard ..19.95
6053 CRT and Keyboard ..19.95
Honeywell VIP 7200 (crt&keyboard) $22.95

Send check or money order to:

Include $1.50 for postage and handling. Overseas orders include $4.00 postage.

DEALER INQUIRES INVITED

CompuCover
P.O. Box 324 (Dept. A)
Mary Esther, FL 32569
Phone (904) 243-5793

✓90

✓ Reader Service—see page 226

```
-D0A00
0A00 C3 55 AC C3 51 AC 7F 0B 4D 42 41 53 49 43 20 4D .U..Q...MBASIC M
0A10 45 4E 55 00 20 20 20 20 43 4F 50 59 52 49 47 48 ENU.    COPYRIGH
0A20 54 20 28 43 29 20 31 39 37 38 2C 20 44 49 47 49 T (C) 1978, DIGI
0A30 54 41 4C 20 52 45 53 45 41 52 43 48 20 20 00 00 TAL RESEARCH  ..
0A40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A50 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A80 00 00 00 00 00 00 00 00 08 A9 00 00 5F 0E 02 C3 ............_...
0A90 05 00 C5 CD 8C A9 C1 C9 3E 0D CD 8C A9 3E 0A C3 ........>....>..
0AA0 8C A9 C5 CD 98 A9 E1 7E B7 C8 23 E5 CD 8C A9 E1 .......~..#.....
0AB0 C3 A7 A9 0E 0D C3 05 00 5F 0E 0E C3 05 00 0E 0F ........_.......
```

Listing 4.

code is correct (see Listing 3).

If you want to use MBASIC (an extended disk BASIC running in CP/M), you could have it execute automatically and then load some particular program that runs under BASIC. In other words, any legitimate command execution after the A> is also possible here. An example of a BASIC program might be something called "MENU." It is set to operate in Listing 4.

So much for the command location. Now you must return this information to the disk resident. Convinced that you have the proper command in place, that the first byte after the 7F is a nonzero byte, and that you have ended the command sequence with a zero (00), you are ready to exit DDT. Type GO. CP/M will give you the A> prompt once again. You may save this by immediately typing

A>SAVE 32 CPM.COM

or you can immediately generate your new CP/M operating system. To do this, type

A>SYSGEN (now hit RETURN)

CP/M responds with

SYSGEN VER 1.4

SOURCE DRIVE NAME (OR RETURN TO SKIP)

Here you hit the return key rather than a drive letter. CP/M responds with

DESTINATION DRIVE NAME (OR RETURN TO REBOOT)A (type A)
DESTINATION ON A, THEN TYPE RETURN (hit RETURN)
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) (now hit RETURN)

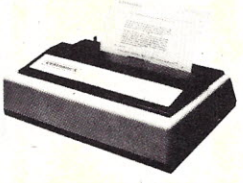
Returning to CP/M command mode (A>), you are ready to give it a try. Hit your reset button to restart your system from scratch. After the sign-on of CP/M and its memory size, it should continue to load your program and execute it. That's proof that you did everything just the way you were supposed to.

If you have trouble, recheck your saved edition of the modified CP/M to see that all of the code has been entered properly. Then try it again. Though I have had no trouble in implementing this technique in several different systems, you might possibly have to redo each step from the beginning to make it right. Its value is that you now have an "automatic" computer. ■

PRINTERS & CRT'S From Orange Micro ↙310

CENTRONICS 737 (RADIO SHACK LINE PRINTER IV)

Word Processing Print Quality

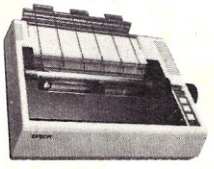


• 18 x 9 dot matrix; suitable for word processing • Underlining • proportional spacing • right margin justification • serif typeface • 50/80 CPS • 9½" Pin Feed/Friction feed • Reverse Platen • 80/132 columns

CENTRONIC 737-1 ..... (List $995) **$Call**

EPSON MX80

Low-Priced Professional Print Quality



• 9 x 9 dot matrix • Lower case descenders • 80 CPS • Bidirectional, Logic seeking • 40, 66, 80, 132 columns per line • 64 special graphic characters: TRS-80 Compatible • Forms handling • Multi-pass printing • Adjustable tractors

EPSON MX80 ..... (List $645) **$Call**



TELEVIDEO CRT'S
PRICES SLASHED!

TVI 912C
TVI 920C
} Please Call Toll Free Prices are too low to advertise

PRINTERS

ANACOM 150 150 CPS, wide carriage, 9 x 9 dot ..... (List $1350) $ Call
CENTRONICS 737 Text processing dot matrix (Radio Shack LP IV) ..... $ Call
CENTRONICS 730 (Radio Shack Line Printer II) 639
BASE 2 800B graphics printer ..... (List $699) $649
OKIDATA MICROLINE 80 ..... (List) $800) 599
NEL 5530-5 letter quality, RO, parallel, tractors ..... (List $2970) $2549
MALIBU Dot graphics, 132 Col, Letter quality ..... $ Call
PAPER TIGER IDS 440 w/graphics & 2K buffer ..... (List $1094) 939
QUME 5/45 Typewriter quality ..... (List $2905) 2499

INTERFACE EQUIPMENT

APPLE II — BASE 2 parallel graphics interface board 160
SSM AIO BOARD Serial/Parallel interface board ..... (List $225) 199
TRS-80 CABLES expansion interface or direct ..... $ Call

TOLL FREE (800) 854-8275
CA, AL, HI (714) 630-3322

Call for FREE CATALOG

Phone orders WELCOME. Same day shipment for VISA, MASTER CHARGE, and AMERICAN EXPRESS. Personal checks require 2 weeks to clear. Add 3% for shipping and handling. California residents add 6%. Manufacturer's warranty included. Prices subject to revision.

Orange Micro, Inc.
3148 E. La Palma, Suite E
Anaheim, CA 92806

Super Special
Apple II 16K
$950.00
reg. 1195.00

INTEGRAL DATA SYSTEMS

440G:	Paper Tiger with Graphics; 2K Buffer	**$950** reg. $1095
460:	Word Processing Quality	**$1099** reg. 1295
460G:	IDS 460 w/Graphics	**$1199** reg. 1395

Centronics 737 High Quality Dot Matrix	**$895** reg. 995.00
Apple Silentype Includes interface and graphic capabilities	**$535** reg. 595.00
Apple Parallel Int.	**$160** reg. $180
Apple Serial Int.	**$175** reg. $195
Centronics Parallel Int.	**$185** reg. $225

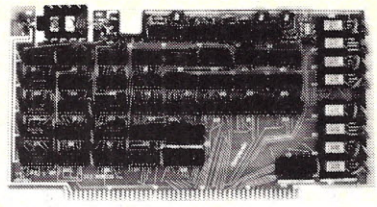
DOUBLE VISION	$295.00
DISK II	
with controller	$525.00
without controller	$445.00
MICROMODEM	$325.00
PASCAL	$425.00
LEEDEX MONITOR	$140.00
KG-12C Green Phosphor 12" Screen w/Glare Cover 18 MHz bandwidth	$275.00

16K RAMS for APPLE II TRS-80 $59

VERBATIM DISKS 10 for $27

The Computer Stop
16919 Hawthorne Blvd.
Lawndale, CA 90260
(213) 371-4010
✓105
MON. - SAT.
10-6

Super Compuprism Color Graphics



For the S-100 Bus. 32K of on board memory allows a 288 H. x 192V. dot matrix, for a total of 55,296 pixels. Every pixel is programable in any one of 16 colors or 16 grey levels completely independent of all other pixels in the matrix.
Compuprism Bare Board with documentation $45, kit $240, ass. and tested $280.

Super Compuprism Bare Board with documentation $50, kit $350, ass. and tested $395.

Add $15 to A & T price for 16 level grey scale. Add $15 to A & T price for memory management port.

Compuprism software package, includes alpa-numberics, point plot, line draw, and TRS-80* graphics simulation $20 or FREE with A & T unit.

Z-80 Users You Can Use TRS-80* Software

We offer an assembled hardware interface which we guarantee will load data from TRS-80* cassettes into any Z-80 based system. (Except sealed units.) The documentation explains how to patch the TRS-80* software to your system. In fact you can virtually change your Z-80 machine into a TRS-80* without making a single hardware change. The documentation also includes an example of patching SARGON II** into a Z-80 system.

The price is $30 or FREE with the purchase of an assembled compuprism or super compuprism unit.

ALL COD ORDERS SHIPPED WITHIN 72 HOURS. 4MHz MOD FOR S.D. SYSTEMS. EXPANDORAM $10. 16 CHANNEL A-D, 8 CHANNEL D-A FOR S-100 BUS, BARE BOARD WITH DOCUMENTATION $45.

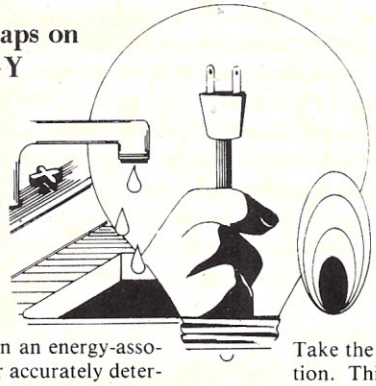
J.E.S. GRAPHICS, P.O. Box 2752
Tulsa, OK 74101, (918) 742-7104

TRS-80* is a trademark of Tandy Corp.
SARGON II** is a trademark of Hayden Book Co.
✓180

These Penny-Pinching Programs Help You Beat High Energy Costs!

Designed for Home and Commercial Use

Here's your chance to put the wraps on staggering energy costs. ENERGY AUDIT helps you inspect any home, analyze your findings and make fuel-conservation investments that result in big savings.



ENERGY CONSUMPTION lets you monitor and manage fuel use for maximum cost efficiency. This combination will mean more dollars in your pocket in these uncertain times.

1. Energy Audit

Whether you're a home owner or involved in an energy-associated business, this is a "must" program for accurately determining heat loss. This program creates a computerized model of any dwelling. It will describe what materials are needed and the estimated construction costs to make a building an energy miser. Requirements: TRS-80, Level II, 16K; Expansion interface with at least 16K; 1 mini-disk drive; and a compatible DOS for disk-based version; and an optional printer. **Order No. 0052RD, disk, $75.00 or 0089R, cassette, $49.95.**

2. Energy Consumption

Take the guesswork out of energy consumption and conservation. This program keeps utility bills for a 5-year period. Records precise amounts used and costs for natural gas, water and electricity. Keep track of energy costs, examine seasonal fluctuations and evaluate conservation efforts you've undertaken. The soaring cost of fuel requires careful energy management. This program can make you a tight-fisted professional! TRS-80, Level II, 16K. **Order No. 0132R $9.95.**

✓40

Instant Software™
PETERBOROUGH, N.H. 03458

THEY'RE EASY TO ORDER. . .
- See Your Instant Software Dealer, or
- Call Toll-Free 1-800-258-5473.

Second Cassette Interface With One IC

By Thomas E. Hutchinson

If you're new to small computers, you probably think one tape recorder is a luxury and two are positively excessive. But some day you'll want to write a program that will read information from one tape, process it and write new data to a second tape.

For example, suppose you have a list of names and addresses stored on a tape as a data file. If someone moves, you'll want to change his address. You can't simply go to that spot on the tape and insert the new information without disturbing nearby data. You have to create a whole new file.

Typically, you'd write a program that would read the data from one tape and write it to the second tape in blocks until the address you want to change is reached. The reading process then stops while you type in the corrected address. This new address is written into the new file on the second tape recorder, and the rest of the names and addresses are alternately read from the first tape recorder and written into the new file on the second.

This method of keeping an address file is only used if the amount of information you wish to store exceeds the 8K or 16K of RAM in your computer. If you have sufficient space in RAM, you would just store your names and addresses in data statements and then save the program in the conventional way on one tape.

Storing Data on Tape

The signal to be recorded on tape comes from pin E on the second cassette port of the PET. This is a square wave of 5-volt amplitude.

I had some success just attenuating this to the proper level for my tape recorder and recording it directly. However, I found that this gives unreliable results with certain tapes. I would save a program in the normal way on the second recorder, and when I attempted to verify that program, I found it was full of errors.

With PEEK(630) for the PET model 2001-8, you can see how many tape errors have been detected during the verify procedure. With some tapes, PEEK(630) was zero every time, and with others, PEEK(630) varied from about 12 upwards even for short programs.

To check whether the tapes themselves were faulty, I repeated the recording and verifying sequence on the tape recorder built into PET. There was no problem here; I got PEEK(630)=0 every time. Some tapes just do not take kindly to recording square waves from my inexpensive second cassette unit.

I looked through back issues of *Kilobaud* to get ideas from others. In Peter Stark's article "Copying Computer Cassettes" (August 1978, p. 94), the author suggested that his tape recorder did not respond well to square wave input. This appeared related to my difficulties, and following his approach to the problem, I designed an active low-pass filter with a cutoff frequency of 3000 Hz (Fig. 1). The purpose is to round off the corners of the square waves by preventing high-order harmonics of the fundamental frequency of the square wave from passing onto the recording heads.

In Fig. 1 the 5-volt TTL signal enters at the left; it is cut down to 2.5 V by a pair of 10k resistors. It passes through the low-pass filter, which allows frequencies up to 3000 Hz to

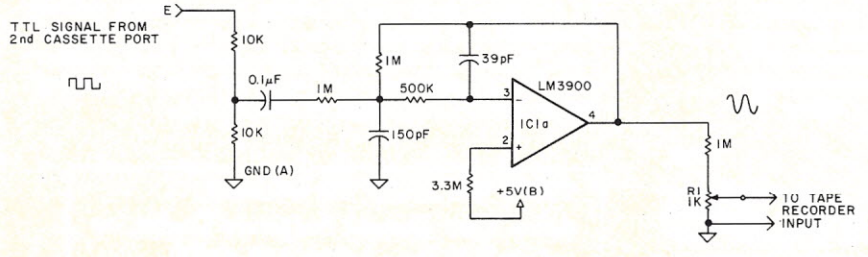


Fig. 1. Low-pass filter rounds off square waves from PET to give better recording.

Thomas E. Hutchinson, 65 Southport St., Apt. 110, Toronto, Ontario, Canada M6S 3N6.

pass with unity gain while attenuating higher frequencies. The output on pin 4 of IC1 is approximately 2.5 volts peak-to-peak, which is cut down to a few millivolts with a resistor network.

The only input on my recorder is a microphone input, which requires only a few millivolts of signal. Some recorders have a high-level auxiliary input, which may accept a signal directly from pin 4 of IC1. The low-pass filter was designed using equations from the *IC Op-Amp Cookbook* by Walter G. Jung.

Reading Data from Tape

The signal from the tape recorder must be squared up and adjusted for 5-volt amplitude before going to the computer. The circuit in Fig. 2 accomplishes this. The signal enters at the left. The level here should be at least 1 volt peak-to-peak. It is clipped by a pair of diodes and then amplified by a factor of 10 by IC1B.

The output on pin 5 is a wave with flat tops and bottoms and an amplitude of 5 volts. To improve the rise and fall times of this wave and make it truly "square," it is fed into the Schmitt trigger constructed around IC1C. The output on pin 9 remains low until the signal from pin 5 rises above 2.6 volts, at which time pin 9 switches high. Pin 9 remains high until the signal from pin 5 falls below 2.1 volts, at which time pin 9 switches low. The sharp corners are thus restored to the square wave coming from the tape. Again, design equations were taken from the *IC Op-Amp Cookbook*.

Turning the Recorder On and Off

A 6-volt signal from pin C on the second cassette interface will drive some tape recorder motors, but not many. As shown in Fig. 3, I use this signal to operate a 6-volt Radio Shack relay, which, in turn, switches the tape recorder on or off by using the remote switch.

The relay is normally open. A manual switch in parallel with the relay contacts allows you to use the fast-forward or rewind buttons when the relay is open. Pin F was designed to go to a switch that would close to ground whenever the play button is depressed on the recorder.

Since I have no such switch, I just grounded pin F as shown in Fig. 2. The only disadvantage with grounding F permanently is that PET will not prompt you with messages such as "press play on cassette 2." Since you obviously have to press the play button when you want to verify, or the play and record buttons when you want to save, I don't find the lack of these messages to be a disadvantage.

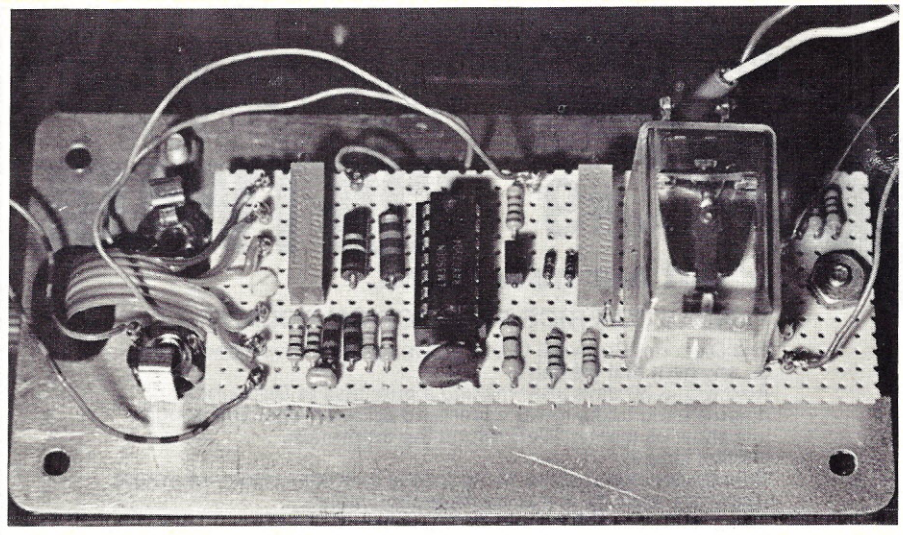


Photo 1. Perfboard is mounted on underside of aluminum lid. Ribbon cable enters at left. Relay is on the right. *(Photos by Dave Lucko)*

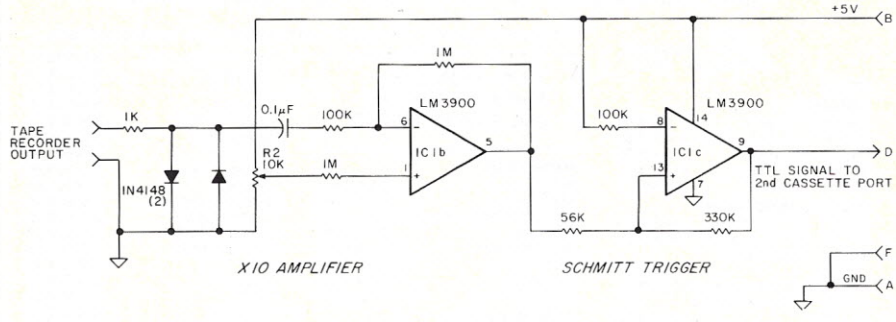


Fig. 2. Tape recorder signal is amplified and changed to a good square wave for PET.

Construction

I constructed the entire system on a piece of perfboard and fit it inside a 5×2½×1½ inch plastic box from Radio Shack.

One precaution I overlooked cost me a new power supply for my tape recorder. I had three jacks screwed down to a common aluminum panel that formed the lid on the aforementioned plastic box. One jack was for the remote, one was for the "microphone input" and the third was for the "speaker output." Unfortunately, the remote jack was not supposed to be at ground potential as were the speaker and microphone jacks, and I consequently short-circuited and burned out the AC adapter. The cure was to mount the remote jack on the plastic side of the box instead of on the aluminum panel.

I soldered a ribbon cable of six wires to posts on the perfboard. It passes through a rubber grommet. I soldered a six-contact edge connector from Radio Shack to the other end, which plugs into the back of the PET.

One section of IC1 is unused. Its pins may be left floating without harm. R1 and R2 are ten-turn trimpots; since they require an initial adjustment only, they can be mounted inside the box on the circuit board.

Adjustment

The first adjustment is to set R1 in Fig. 1 for the correct recording level. You can conveniently generate a signal for this purpose by first loading a fairly long program (at least one minute of tape time is best) on cassette 1. Then type SAVE"TESTER",2. Press the return key. A signal should appear at the output of IC1A. Press re-

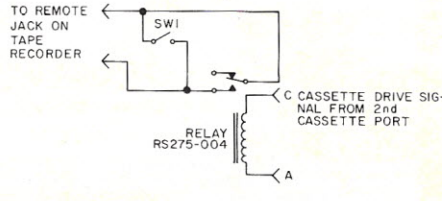


Fig. 3. A relay lets PET turn second cassette motor on and off.

FREE with software purchase — choice of: 1. One year subscription to InfoWorld 2. CP/M Summary ($4.95 value)

✓250

DISCOUNT SOFTWARE

Ad#9

✓ out our new items.

FANTASTIC PRICE PROTECTION POLICY

The Discount Software Group will match any advertised price on any item that we carry.
Also within 30 days after making a purchase at Discount, if you should find a lower advertised price on what you bought, just show us that ad. We'll refund the difference.
It's that simple.
Take advantage of some of the lowest everyday prices anywhere.
Enjoy the security of a price protection plan that guarantees the utmost saving possible, both before and after you buy.
When combined with the availability of full professional support and automatic update service you have the Ultimate Software Plan.
No one else can offer such total peace of mind.
It's an uncomplicated, convenient, logical way to acquire software.

DISK WITH MANUAL / MANUAL ONLY

CP/M users: specify disk systems and formats. Most formats available.

CP/M

OSBORNE ¶
General Ledger# ... $ 59/$20
Acct Rec/Acct Pay# ... $ 59/$20
Payroll w/Cost# ... $ 59/$20
Buy 2 get 1 free ... $118/$57
All 3 & CBASIC-2 ... $199/$71

DIGITAL RESEARCH®
CP/M® 2.2 Northstar ... $149/$25
✓ CP/M® 2.2 Micropolis ... $169/$25
✓ CP/M® 2.2 Durango F-85 ... $169/$25
CP/M® 2.2 Cromemco ... $189/$25
CP/M® (other versions) ... Call
✓ PL/I-80 ... $459/$35
Mac ... $ 85/$15
Sid ... $ 65/$15
Z-Sid ... $ 95/$15
Tex ... $ 70/$15
DeSpool ... $ 45/$10

MICROSOFT
Basic-80 ... $294/$30
Basic Compiler ... $334/$30
Fortran-80 ... $384/$30
Cobol-80 ... $574/$30
Macro-80 ... $144/$20
Edit-80 ... $ 84/$20
MuSimp/MuMath ... $224/$25
MuLisp-79 ... $174/$20

MICRO DATA BASE SYSTEMS
HDBS ... $250/$40
MDBS ... $750/$40
Other ... Call

S.O.F.T.W.A.R.E.
MicroTax®‡
Federal individual ... $749/$50
Federal corporate ... $249/$25
State individual ... $249/$25

TCS‡
✓ General Ledger ... $ 79/$25
✓ Acct Receivable ... $ 79/$25
✓ Acct Payable ... $ 79/$25
✓ Payroll ... $ 79/$25
✓ All 4 ... $269/$99

SUPERSOFT
Forth (8080 or Z80) ... $129/$25
Diagnostic I ... $ 49/$20
Other disk software ... less 10%

SOFTWARE WORKS
Adapt ... $ 69/ na
Ratfor ... $ 86/ na

COMPUTER PATHWAYS
Pearl (level 1)# ... $ 99/$25
Pearl (level 2)# ... $299/$25
Pearl (level 3)# ... $549/$25

COMPLETE BUSINESS SYSTEMS‡
✓ Creator ... $269/$25
✓ Reportor ... $169/$20
✓ Both ... $399/$45

T.I.M. DBMS ‡¶
Fantastic/Easy to use Special $299

MICROPRO
WordStar ... $324/$40
✓ Mail/Merge ... $114/$25
WordStar/Mail-Merge ... $434/$65
DataStar ... $279/$35
Word-Master ... $119/$25
SuperSort I ... $199/$25
SuperSort II ... $169/$25
SuperSort III ... $119/$25

PEACHTREE®¶‡
General Ledger ... $449/$40
Acct Receivable ... $449/$40
Acct Payable ... $449/$40
Payroll ... $449/$40
Inventory ... $449/$40
Property Mgt ... $899/$40
C.P.A. Client Write-up ... $899/$40
Mailing Address ... $349/$40

STRUCTURED SYSTEMS
General Ledger# ... $747/$40
Acct Receivable# ... $747/$40
Acct Payable# ... $747/$40
Payroll# ... $747/$40
Inventory Control# ... $447/$40
Analyst# ... $197/$20
Letteright# ... $167/$20
NAD# ... $ 87/$20
QSORT ... $ 87/$20

GRAHAM-DORIAN¶
General Ledger# ... $693/$40
Acct Receivable# ... $693/$40
Acct Payable# ... $693/$40
Job Costing# ... $693/$40
Payroll# ... $493/$40
Inventory# ... $493/$40
Cash Register# ... $493/$40
Apartment Mgt# ... $493/$40

MICRO-AP
Selector III-C2# ... $269/$20
Selector IV# ... $469/$35
✓ S-Basic ... $269/$25

WHITESMITHS
"C" Compiler★ ... $600/$30
Pascal (incl "C")★ ... $750/$45

EIDOS SYSTEMS
Kiss ... $299/$25
K-Basic ... $529/$50

ORGANIC SOFTWARE
TextWriter III ... $111/$20
✓ DateBook ... $269/$25

SoHo Group
✓ MatchMaker ... $ 84/$10
✓ WorkSheet ... $124/$20

"OTHER GOODIES"
Tiny "C" ... $ 89/$50
✓ Tiny "C" Compiler ... $229/$75
CBASIC-2 ... $ 89/$15
✓ OS-1 ... $229/$45
Pascal/Z ... $369/$30
Pascal/UCSD ... $299/$30
Pascal/MT+ ... $224/$30
Pascal/M ... $149/$20
Nevada Cobol ... $ 89/$25
FMS-80 ... $649/$45
dBASE II DBMS ... $629/$35
Condor DBMS ... $599/$30
Vulcan DBMS ... $469/$30
T.I.M. DBMS‡ ... $329/$35
CBS ... $369/$45
Whatsit? ... $149/$25
Vsort I ... $159/$25
✓ MicroStat ... $224/$15
String/80 ... $ 84/$20
✓ Vedit ... $ 99/$15
Postmaster ... $149/$20
✓ WordSearch ... $179/$25
✓ SpellGuard ... $269/$25
Spell Binder ... $349/$45
Magic Wand ... $299/$45
Electric Pencil II ... less 15%
CPAids ... less 12%

APPLE II

MICROSOFT
Softcard (CP/M) ... $292
Other ... Call

PERSONAL SOFTWARE
Visicalc® ... $122
CCA Data Mgr ... $ 84
Desktop/Plan ... $ 84

PEACHTREE®¶‡
General Ledger ... $224/$40
Acct Receivable ... $224/$40
Acct Payable ... $224/$40
Payroll ... $224/$40
Inventory ... $224/$40

MUSE
Super-Text II ... $127
Other disk software ... less 10%

STC (Software Tech.)
✓ Prof. Time & Billing ... $279
Other ... less 15%

"OTHER GOODIES"
✓ Data Factory ... $ 84
Whatsit? ... $129
✓ Creator ... $229
✓ LedgerPlus (GL A/R & A/P) ... $549

TRS-80 MODEL II
CP/M 2.2 (P&T) ... $159/$35
Electric Pencil II ... less 15%

NORTHSTAR
✓ NorthWord ... $299
✓ Mail Manager ... $239
✓ Info Manager ... $369
✓ General Ledger ... $749
✓ Acct Receivable ... $449
✓ Acct Payable ... $449

★—Special Bonus with order ‡—Requires microsoft BASIC ¶—Supplied in source code #—Requires CBASIC-2 ®—Mfgs. Trademark

ORDERS ONLY—CALL TOLL FREE VISA • MASTERCHARGE

1-800-854-2003 ext. **823** • **Calif. 1-800-522-1500** ext. **823**

Overseas—add $10 plus additional postage • Add $2.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D. ok • Prices subject to change without notice All items subject to availability •

THE DISCOUNT SOFTWARE GROUP
1610 Argyle Ave., Bldg. 102 • Los Angeles, CA 90028 • (213) 666-7677

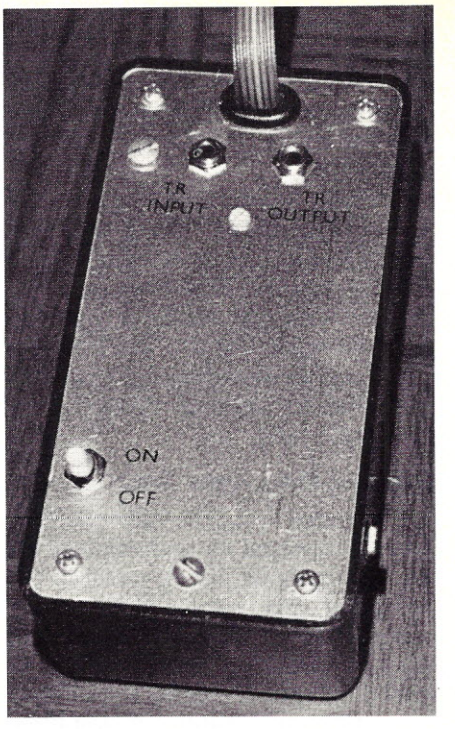


Photo 2. Plastic box houses entire circuit and insulates the remote control jack at bottom right from input and output jacks.

cord and play on cassette 2. Set the record level on the cassette to maximum and adjust R1 so that the signal level meter on your recorder is at the top end of the allowable range, much as you would do if you were recording music.

The second adjustment will be to set R2 in Fig. 2. Disconnect the tape recorder output from IC1B. Connect a dc voltmeter between pin 5 of IC1 and ground. Adjust R2 until the voltmeter reads 2.5 volts. This ensures that the signal output at pin 5 will be a symmetrical square wave when data is fed into IC1B from the recorder.

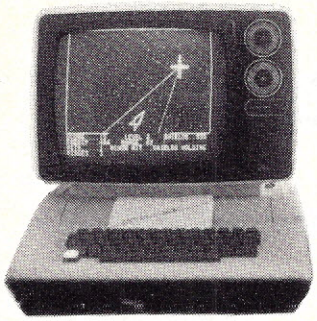
Everything should now be ready to go. To test it, enter a program from the keyboard or from the first cassette into PET. Type SAVE"TESTER",2. Press the return key. You should hear the relay click. Immediately press play and record on cassette 2. The recorder will stop automatically when the program has been recorded.

Press rewind and turn on SW1 (Fig. 3). After rewinding, turn off SW1. Type VERIFY"TESTER",2. Press the return key. The program should verify normally. Immediately after the verifying has been completed, type PRINT PEEK(630). Press the return key. The answer should be zero if your system has detected no dropout errors. ■

APPLE — JACK

the graphics & games people

New!
Super Starbase Gunner



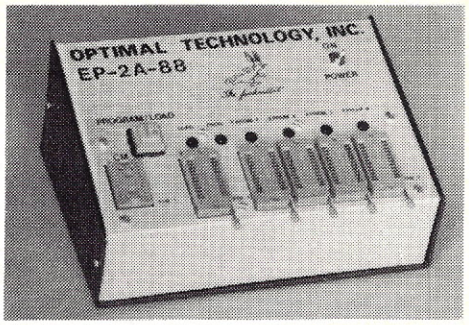
$19.95 DISK **$19.95 DISK**

Most shoot-em-up target games are 2-D shoot across the screen type, and quite frankly there is a glut of inferior ones. A need for a new approach exists, such as fast 3-D HIRES simulations with clever and complex challenges. How about shooting into the screen, into 3-D space, where the target is mathematically many feet behind the screen surface? How about computer intelligent targets that shoot back and use strategy and learn? How about all this and the best attributes of the more popular games? Let's include high score, 10 levels of play, snappy sound effects, colorful explosions and real time graphics. Why not go all the way and have a three dimensional gunsight? A real space battle simulation. . . Nah. . . no one would believe it or could even write it. Right?
WRONG!! WE HAVE IT. . . and it is SUPER STARBASE GUNNER. We are very excited about this product because it is all the things we wish we had and didn't. And you can have it now with this introductory offer.

SUPER STARBASE GUNNER DISK. . . $19.95 48K with APPLESOFT ROM

AVAILABLE FROM YOUR DEALER OR DIRECT FROM
APPLE—JACK, BOX 51, CHERRY VALLEY, MA 01611
✓314 (INQUIRIES INVITED)

Model EP-2A-88
EPROM Programmer



Fast as Jackrabbits . . . Well, almost!

In Australia, two rabbits can reproduce over 13 million offspring in 3 years . . . at 105 seconds per 2716, the **EP-2A-88** can reproduce 1,892,160 EPROMS in 3 years. **Single push button control, the EP-2A-88 checks if EPROMS are erased, programs and verifies. It also checks for defective EPROMS.**

Two basic models are available, The EP-2A-88-1 will accept Copy (CM) modules for the 2758, and 2716 EPROMS. The EP-2A-88-2 will accept copy modules for the 2716, 2732 and TMS 2532 EPROMS. Power requirements are 115 VAC 50/60 Hertz at 15 watts.

Part No.	Description	Price
EP-2A-88-1	EPROM Programmer	$490.00
EP-2A-88-2	EPROM Programmer	490.00
CM-50	Copy Module for 2716, TMS 2516 EPROMS	25.00
CM-70	Copy Module for 2758 EPROMS	25.00
CM-20	Copy Module for 2732 EPROMS	25.00
CM-40	Copy Module for TMS-2532 EPROMS	25.00
	Non-Standard Voltage Option (220 v, 240 v, 100 v)	15.00

Optimal Technology, Inc.
Blue Wood 127, Earlysville, Virginia 22936
Phone (804) 973-5482
✓29

SAVE YOUR TIME ...AND YOUR MONEY.

Instant Software has the two best mail list programs available for your TRS-80 Model I and Model II.

Mail/List for Model I and Model II

This mailing list program maintains separate alphabetical and zip code files in *constant sort*. When you add a name to your list, it will *automatically* be inserted into its correct position in the files; therefore it's always ready to print labels!

It will record your information in these fields: NAME, ADDRESS, CITY, STATE, ZIP, PHONE NUMBER, PHONE EXTENSION and a five character CODE field. You have the choice of a 3 line, 4 line, or user defined label format. It can even include (optionally) a message line on your label!

The programs most outstanding feature is its sorting capabilities. Mail/List allows you to choose which names you want to be printed from the whole list. For example, all people in one zip code, or all people named Jones, who are living in a particular city or state. For any name in your list you can assign a code within the CODE field. You can then specify the code when printing labels, and only names with that code will be printed out. You can specify up to 9 different codes!

Every business and organization will save time and money with Mail/list to keep track of customers or members.

TRS-80 Model I version, Order No. 5000RD $99.00.
Requires 16K RAM, Expansion Interface with at least 16K RAM, one disk-drive and a printer.

TRS-80 Model II version, Order No.5001RD $199.00.
Requires 64K RAM and printer.

WRITE FOR OUR NEW CATALOG

TO ORDER: See Your Local Instant Software Dealer or Call Toll-Free 1-800-258-5473.

One-D Mailing List

Here is a mailing list system that can be run on only ONE disk-drive! You can have up to 17 fields of selection for name/address retrieval.

•Disk versatility allows you to add, delete, or change the numerous details stored in the system.

•Features of the One-D Mailing List includes: •Automatic name sort (alphabetically or by ZIP code). •Rapid access to any name on file. •Easy error correction and recovery. •Prints selective name listings. •Revise or update listings at any time. •Up to 2500 names on-line (with 4 drives). •Prints a list of all names on file. •Prints mailing labels. This package requires the following minimum system: 1. A TRS-80 Model I Level II microcomputer with 16K RAM. 2. An Expansion interface with 0 to 32K of RAM. 3. A single disk drive (extra drives optional). 4. A printer. 5. Any TRSDOS compatible Disk Operating System.

Order No. 0123RD $24.95.

✓40

Instant Software™

PETERBOROUGH, N.H. 03458

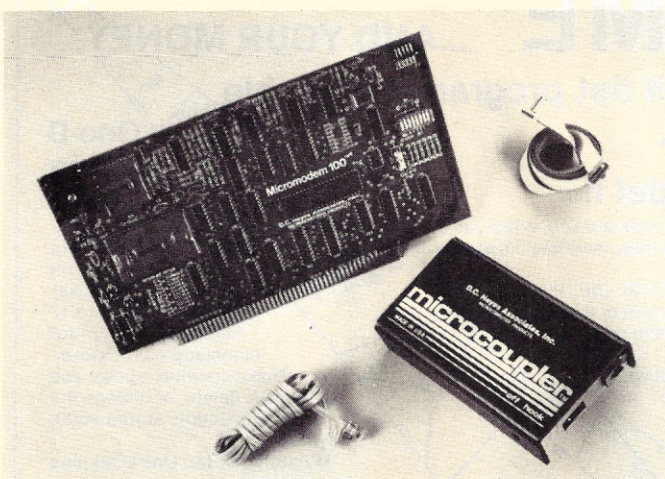
Customer Service
Hayes Microcomputer Products, Inc.
5835 Peachtree Corners East
Norcross, GA 30092

Modem Control

BASIC control program for the Hayes' Micromodem 100 or 80-103A.

Data communications is beginning to receive attention in the small systems field, and articles about it are appearing with greater frequency in many of the popular magazines. This is due to the fact that the telephone network is probably the single most powerful peripheral device that can be connected to a computer. It is also one of the most complex and confusing.

The programming considerations for a telephone line are different from those of the more familiar computer peripherals. First, it is necessary to establish a connection. This means either dialing a number or detecting a ring and answering the phone. Then a carrier signal must be established. The connection must be checked, and the program must be prepared to give up and try again because telephone connections don't always work.



Micromodem 100. (Photo courtesy Hayes Microcomputer Products, Inc.)

Sometimes when you are called, it's not who you expect; and when you dial, you may get a wrong number, the line may be busy or you might get a bad line. Once you get a good connection, it may still go away unexpectedly, and even when it doesn't, you will get some random errors.

This sounds pretty bad, but once you program the computer to worry about these things, the process is mostly automatic, and being able to send data and programs across town or across the country is really worth the trouble.

The Program

In order to make this program as accessible as possible to as many different people as possible, I have written it in a common dialect (Microsoft) of BASIC. This program will run as written under the CP/M version of Microsoft BASIC.

For other BASICs and other versions of Microsoft BASIC, some changes may be required —especially lines 370 and 470 (see below). I have stuck to standard features of the language as much as possible and have generally tried to write the program so that it will be readable, to the extent of sacrificing efficiency where necessary.

The purpose of the program is to perform some special-purpose I/O, so the most important parts of it make heavy use of the IN and OUT features of Microsoft BASIC. This includes keyboard I/O during the communication phase of the program. That is necessary because BASIC otherwise offers no way for a program to test whether a key has been struck or to read a single byte without having to read a whole line.

The only really obscure coding (for which I apologize) is the pair of POKEs at lines 370 and 470. These mysterious POKEs disable part of BASIC's keyboard logic (in the CP/M version) so that the program can take complete control of the keyboard. Between statements, the BASIC interpreter checks the keyboard status to see if a key has been struck. If one has, the intepreter reads it to see if it was a control/C. If it was, it stops running the program and goes into direct mode.

This is essential if the control/C facility is to be able to stop a program that is caught in an infinite loop. It means, however, that a BASIC program that is looping, waiting for a keyboard character, will usually not see any. This happens because between the times the program is looking at the port, the interpreter is also looking, and whenever a character is typed, the interpreter takes it

Program A. Modem Control program.

```
5 REM           80-103A MODEM CONTROL PROGRAM

10 DEFINT A-Z    'MAKE ALL VARIABLES INTEGERS FOR SPEED
20 SKB=&HE4 : DKB=&HE5 : KBB=1 :EOT=4     'KEYBOARD ADDRESSES
30 REM NAME THE MODEM FUNCTIONS
40 M0=128:M1=M0+1:M2=M1+1                 'DEVICE ADDRESSES FOR MODEM
50 RI=128:CD=64:OE=16:FE=8:PE=4:TE=2:RRF=1        'STATUS BITS
60 PI=16:SBS=8:LS=2:EPE=1                         'UART CONTROL BITS
70 OH=128:RD=32:ST=16:BK=8:MS=4:TXE=2:BRS=1       'MODEM CONTROL BITS
80 TRUE=-1:FALSE=0:YE$="YES"                      'INSERT SOME ENGLISH
90 REM SET THE DEFAULT OPTIONS
100 B3=FALSE:PARITY=FALSE:EVEN=FALSE:LNG=3
```

More →

away, sees (usually) that it's not a control/C and throws it away.

The Mits version of this BASIC has a CONSOLE statement that can be used to turn off the normal console functions. In this case, line 370 should read CONSOLE 0,15, and line 470 should be chosen to restore the correct console function. Remember that the console must be restored to its normal operation when the program is done or its normal functions may be lost.

For Microsoft BASIC Rev. 4.51, lines 370 and 470 should be as in Fig. 1.

Organization of the Program

The first section of Program A is devoted to initialization, much of it for the benefit of the reader. On lines 20-80, I assign names to a variety of useful constants (such as the I/O address of the modem). As far as BASIC will allow, I have made these the same as the names used in the manual.

Line 20 defines the keyboard physical I/O port. SKB is the address of the keyboard status port; DKB is the address of the keyboard data port; and KBB is a mask containing a 1 bit in the bit position of SKB, which indicates the presence of valid data in DKB. This status bit is assumed to be positive true (1 = data present). If this is not the case, then on line 400, the = should be changed to a <>.

Lines 120-160 calibrate the timing loop at line 1040. The loop at 1040 has two exit conditions—when the loop variable Z = T and when the modem status port has a 1 bit corresponding to a 1 bit in the special mask XT. For calibration, the XT mask is set to the transmitter register empty bit, and the loop count T is set to a large value. The modem is then started at 110 baud, its transmitter is filled with zeros and the timing loop is called with a GOSUB. Under these conditions, it will take 100 milliseconds to exit

```
370 POKE &H137B, &HC9
470 POKE &H137B, &HCD
```

Fig. 1.

Program A continued.

```
110 ECHO=FALSE
120 REM CALIBRATE THE TIMING LOOP
130 T=2000:XT=TE                    'PUT LOOP IN CALIBRATE  MODE
140 OUT M2,0:OUT M1,3*LS*EPE              'AT 110 BAUD, 1CHAR TAKES 100 MS.
150 OUT M0,0:OUT M0,0               'FILL THE UART TRANSMIT REGISTERS
160 GOSUB 1040           'RETURNS WHEN ONE HAS BEEN CLOCKED OUT
170 TC=Z:XT=0                       'TC IS # OF ITERATIONS FOR 100 MS.
180 REM NOW ASK A FEW QUESTIONS
190 INPUT "WANT TO CHANGE OPTIONS";I$
200 IF I$<>YE$ GOTO 320
210 INPUT "HIGH BAUD RATE (300)";I$
220 B3=I$=YE$
230 INPUT "GENERATE AND CHECK PARITY";I$
240 PARITY=I$=YE$
250 IF NOT PARITY GOTO 280
260 INPUT "EVEN PARITY";I$
270 EVEN=I$=YE$
280 INPUT "CHARACTER LENGTH IN BITS (NOT INCLUDING PARITY)";I
290 LNG=I-5
300 INPUT "LOCAL KEYBOARD ECHO";I$
310 ECHO=I$=YE$
320 OUT M1,(PI AND NOT PARITY)+(LS*LNG)+(EPE AND EVEN)
330 INPUT "PLACE CALL";I$
340 IF I$=YE$ THEN GOSUB 680 ELSE GOSUB 530
350 IF (INP(M1) AND CD) = 0 GOTO 190     'IF WE DIDN'T CONNECT, GO BACK
360 PRINT "CONNECTION ESTABLISHED"
370 POKE &H1262,&H97                'DISABLE CTRL/C LOGIC IN BASIC!
380 IF (INP(M1) AND CD) = 0 GOTO 450     'CHECK FOR LOST CARRIER
390 IF INP(M1) AND RRF THEN PRINT CHR$(INP(M0));:GOTO 380 'PRINT INPUT
400 IF (INP(SKB) AND KBB) = 0 GOTO 380  'CHECK KBD
410 IF INP(M1) AND TE THEN C=INP(DKB) AND &H7F : OUT M0,C
420 IF ECHO THEN PRINT CHR$(C);
430 IF C=EOT GOTO 490
440 GOTO 380
450 PRINT "LOST CARRIER, HANGING UP"
460 OUT M2,0              'HANG UP AND TURN OFF MODEM
470 POKE &H1262,&HA7              'PUT CTRL/C BACK
480 GOTO 190
490 PRINT "EOT"
500 PRINT "HANGING UP"
510 GOTO 460
520 REM SUBROUTINE WAITS FOR PHONE TO RING, ANSWERS, AND AWAITS CARRIER
530 PRINT "WAITING FOR PHONE TO RING"
540 IF INP(M1) AND RI GOTO 540   'WAIT FOR RI
550 PRINT "THE PHONE IS RINGING"
560 IF (INP(M1) AND RI) = 0 GOTO 560     'WAIT TIL END OF RING
570 OUT M2,OH+TXE+(B3 AND BRS)           'ANSWER & TURN ON CARRIER
580 PRINT "WAITING FOR CARRIER DETECT"
590 FOR I=1 TO 150                'GIVE HIM 15 SECS TO RAISE CARRIER
600 IF INP(M1) AND CD THEN RETURN
610 T=TC:GOSUB 1040               '100 MSEC EACH PASS THRU LOOP
620 NEXT I
630 OUT M2,0                      'HANG UP PHONE
640 PRINT "NO CARRIER -- GIVING UP"
650 RETURN
660 REM END OF PHONE ANSWERING SUBROUTINE
670 REM THIS SUBROUTINE GETS A PHONE #, DIALS IT, AND WAITS FOR CARRIER
680 INPUT "PHONE NUMBER";PH$
690 OUT M2,OH             'TAKE PHONE OFF HOOK
700 T=TC*20:GOSUB 1040  'WAIT 2 SECONDS FOR DIAL TONE
710 PRINT "DIALING - ";
720 FOR I=1 TO LEN(PH$) 'LOOP THRU PHONE NUMBER
730 D=ASC(MID$(PH$,I,1))                 'GET ONE CHARACTER
740 IF D=42 THEN T=TC*20:GOSUB 1040:NEXT I      '*=2 SEC DELAY
750 D=D-48
760 IF D<0 OR D>9 THEN NEXT I    'IGNORE NON-DIGITS
770 PRINT D;                      'PRINT DIGITS WHILE DIALING
780 TB=TC/2
790 TM=TC/2-4
800 IF D=0 THEN D=10              '0 DIALS AS 10 PULSES
810 FOR J=1 TO D                  'LOOP TO FORM THE PULSES
820 OUT M2,0                      'FORM PULSE BY GOING ON HOOK
830 T=TB:GOSUB 1040      'PULSE LASTS 60 MSEC
840 OUT M2,OH+MS                        'END OF PULSE
850 T=TM:GOSUB 1040      '40 MSEC BETWEEN PULSES
860 NEXT J
870 T=TC*4:GOSUB 1040             '1/2 SEC BETWEEN PULSES
880 NEXT I
890 PRINT
900 PRINT "FINISHED DIALING"
920 PRINT "NOW WAITING FOR HIS CARRIER"
930 FOR I=1 TO 300       'GIVE HIM ABOUT 30 SECONDS
940 T=TC:GOSUB 1040      'WAIT 100 MSEC
942 REM WHEN WE HEAR A CARRIER, WE TURN OURS ON
944 IF (INP(M1) AND CD)=0 GOTO 960
946 OUT M2,OH+MS+TXE+(BRS AND B3)'       TURN ON MODEM
948 X=INP(M0):X=INP(M0)'                 CLEAR UART DATA REGISTERS
950 RETURN
960 NEXT I
970 PRINT "NO CARRIER -- GIVING UP"
980 OUT M2,0
990 INPUT "WANT ME TO TRY AGAIN";I$
1000 IF I$=YE$ GOTO 690
1010 RETURN               'COULDN'T DO IT
1020 REM END OF DIALING SUBROUTINE
1030 REM TIMING LOOP -- IT IS CALIBRATED USING MODEM CLOCK
1040 FORZ=1TOT:IFINP(M1)ANDXTTHENRETURNELSENEXTZ
1050 RETURN
```

the loop.

In that time, the loop variable Z will have been incremented a number of times. Its value represents the number of repetitions of the loop needed to equal 100 msec. Later when this timer is used, XT is set to 0, T is set to the desired time in 100 msec units times that value, and a GOSUB is made to 1040.

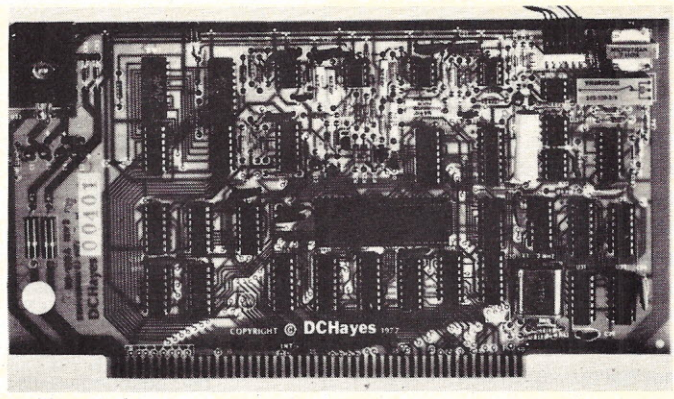
This gives reliable timing with an accuracy of about 10 percent or so on systems with widely differing memory and processor speeds. On my system with a 2 MHz 8080 and no wait states, this loop runs about seven iterations. If your system is much slower, it won't be able to keep up at 300 baud.

Lines 180-330 allow the operator to change the various UART and modem options. This should be fairly clear if you look at the appropriate sections in the modem manual.

Line 340 establishes the telephone connection by calling appropriate subroutines either to answer the phone or to dial a call.

Lines 380-440 are a loop to transfer data between the modem and the display and between the keyboard and the modem. Line 380 checks to make sure the phone connection hasn't gone away. Line 390 checks for received data in the modem and prints it if it finds any. Note that the output device must be at least as fast as the modem (110 or 300 baud, even during carriage returns!), or some data will be lost. Line 400 checks for keyboard input, and line 410 reads it in, strips the parity bit and transmits it if the transmitter is not busy.

If the transmitter is busy, the program will try again the next time through the loop. Line 420 echoes local input if selected, and line 430 checks for EOT (control/D) from the keyboard. This character is used to tell the program that you are done with it and to hang up the phone.



The 80-130A Data Communications Adapter.

Lines 520-650 are a subroutine to wait for the phone to ring. When the phone rings, the subroutine prints a message and waits in line 560 until the end of the ring. Line 570 then turns on the modem. The OH bit takes the modem off the hook (thus answering the phone), the TXE bit turns on the modem carrier and the BRS bit selects the high baud rate if the operator has requested it. It loops (lines 590-620) waiting for a carrier from the other end. The loop exits on a detecting carrier. If no carrier has been detected after 15 seconds, it hangs up again (OUT M2,0) and returns.

Lines 670-1020 are the dialing subroutine. First it gets a phone number in the string PH$ at line 680. Then it takes the phone off the hook at line 690 and waits 2 seconds for the telephone exchange to turn on its dial tone (which indicates its readiness to accept dial pulses). The loop from lines 720-880 loops through the digits of PH$ with I selecting individual digits. Line 730 puts the numeric equivalent of the Ith byte of PH$ into D. If it's an asterisk, line 740 executes a 2-second delay (this is useful on PBX or other systems with a second dial tone).

Lines 750 and 760 make sure the character is a digit and ignore non-digits. This allows you to type in 1(404)555-1212, for example, instead of 14045551212, which is much harder to check. TB and TM are time constants for the break and make times for forming the dial pulses.

The phone company specs these pulses at 61 percent

Program B. File Giver program.

```
5 REM             FILE GIVER PROGRAM

10 DEFINT A-Z    'MAKE ALL VARIABLES INTEGERS FOR SPEED
15 CLEAR 2000
20 REM NAME THE MODEM FUNCTIONS
30 M0=128:M1=M0+1:M2=M1+1                'DEVICE ADDRESSES FOR MODEM
40 RI=128:CD=64:OE=16:FE=8:PE=4:TE=2:RRF=1      'STATUS BITS
50 PI=16:SBS=8:LS=2:EPE=1                       'UART CONTROL BITS
60 OH=128:RD=32:ST=16:BK=8:MS=4:TXE=2:BRS=1     'MODEM CONTROL BITS
70 TRUE=-1:FALSE=0:YE$="YES"                    'INSERT SOME ENGLISH
80 REM SET THE DEFAULT OPTIONS
90 B3=FALSE:PARITY=TRUE:EVEN=TRUE:LNG=2
100 REM
       CALIBRATE THE TIMING LOOP
110 T=2000:XT=TE                 'PUT LOOP IN CALIBRATE  MODE
120 OUT M2,0:OUT M1,3*LS*EPE             'AT 110 BAUD, 1CHAR TAKES 100 MS.
130 OUT M0,0:OUT M0,0            'FILL THE UART TRANSMIT REGISTERS
140 GOSUB 10520          'RETURNS WHEN ONE HAS BEEN CLOCKED OUT
150 TC=Z:XT=0                    'TC IS # OF ITERATIONS FOR 100 MS.
155 REM
       SET UP TO TRANSMIT FILE
160 OUT M1,(PI AND NOT PARITY)+(LS*LNG)+(EPE AND EVEN)+SBS
1000 ACK=6:NAK=21:CR=13
1100 INPUT "FILE NAME";F$
1200 OPEN "I", #1, F$
1300 GOSUB 10000
1305 IF (INP(M1) AND CD) = 0 GOTO 1300
1310 PRINT "CONNECTION ESTABLISHED"
1312 REM
       GET A LINE FROM THE FILE
1315 DF=FALSE'  CLEAR THE DONE FLAG (WE'RE NOT DONE YET)
1320 IF DF GOTO 1600
1330 IF EOF(1) GOTO 1570
1340 LINE INPUT #1, L$
1345 IF LEN(L$)=0 GOTO 1330
1347 REM
       COMPUTE A CHECKSUM
1350 CS=0
1360 FOR I=1 TO LEN(L$)
1370 CS=CS XOR ASC(MID$(L$,I))
1380 NEXT I
1385 IF CS=ACK THEN CS=0'        MAKE SURE CHECKSUM DOESN'T LOOK LIKE ACK
1387 REM
       SEND THE LINE
1390 FOR I=1 TO LEN(L$) 'LOOP THRU LINE AGAIN
1400 IF INP(M1) AND TE THEN OUT M0,ASC(MID$(L$,I)):GOTO 1460
1405 IF (INP(M1) AND CD) = 0 GOTO 1670
1410 IF (INP(M1) AND RRF) = 0 GOTO 1400
1420 C=INP(M0)
1430 IF C=NAK THEN GOTO 1710
1440 PRINT CHR$(C);
1450 GOTO 1400
1460 NEXT I
1465 REM
       FOLLOW IT WITH A CARRIAGE RETURN
1470 IF (INP(M1) AND TE) = 0 GOTO 1470
```

More →

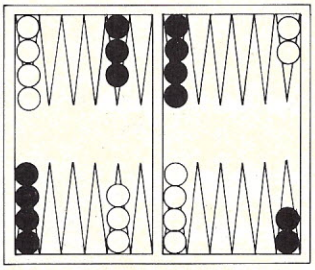
Proven Favorites... These 10 Popular Games Offer Exciting New Challenges

Here are 10 games that have never lost popularity. They've been played in many forms for many years. And now they're among the favorite software packages in the computerized home-entertainment field.

Don't miss out on the excitement, challenge and downright fun of these programs. Take the word of thousands of satisfied players. They're still tops. Order yours today and play your kind of game.

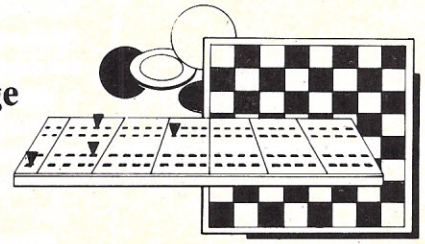
TRS-80*

Beginner's Backgammon and Keno



BEGINNER'S BACKGAMMON/KENO—Why sit alone when you can play these fascinating games: ● BACKGAMMON: Play against the computer in a game that's sure to sharpen your skills; ● KENO: Enjoy this popular Las Vegas gambling game—guess the right numbers and win big! **(T1) Order No. 0004R $7.95.**

Your Cribbage and Checkers Partner



YOUR CRIBBAGE AND CHECKERS PARTNER—● CRIBBAGE is a two-person game that you are sure to enjoy. This is NOT a tutorial—it is a game worthy adversary. ● CHECKERS: An old favorite which follows international rules, including multiple jumps. **(T1) Order No. 0068R $9.95.**

CARDS—A one-player package to let you play, with your computer, these famous games: ● DRAW AND STUD POKER: These programs will keep your game sharp; ● NO-TRUMP BRIDGE: Develop your strategy and (hopefully) increase your skill. **(T1) Order No. 0063R $7.95.**

CHESSMATE-80—This versatile chess opponent gives you a choice of ten levels of play, from the "blitz" level (the computer has 3 seconds to move) to the infinity level (where the computer will consider every possible move—which could take years). This machine-language program is a conservative player and follows all the rules of international play. CHESSMATE-80 can teach you how to move and allow you to set up the board and play end games or special problems. CHESSMATE-80 battled Sargon II to a draw at two minutes a move and beat Microchess 1.5 in six moves. **(T1) Order No. 0057R $19.95.**

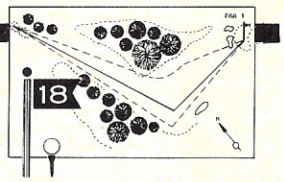
BOWLING—Let your TRS-80 set up the pins and keep score. One player can pick up spares and get strikes. **(T1) Order No. 0033R $7.95.**

OTHELLO—Pit your strategic powers against a merciless, computerized opponent. You play on a board of 64 squares. When you capture your opponent's game disks (by bracketing them with your own disks), they immediately change sides to become members of your set. You can capture several game pieces at one time as long as they are in-line horizontally, vertically or diagonally. Major reversals of score are commonplace as whole blocks of men change side in an instant. **(T1) Order No. 0046R $9.95**

(T1)=TRS-80 Model 1, LevelII, 16K RAM

Apple**

GOLF



GOLF—Without leaving the comfort of your living room you can enjoy a challenging 18 holes of golf with a complete choice of clubs and shooting angles. Now, you need never cancel your game because of rain. One or two players can enjoy this game on your Apple II with Applesoft and 32K. **Order No. 0018A $7.95**

PET***

CASINO I—Gamblers, gather round for: *BLACKJACK—a fun-to-play and tutorial version that allows you to play every combination that they play at the MGM Grand Hotel in Las Vegas; *ROULETTE—also a game *and* a tutorial which could enable you to develop the skill to make a fortune at the tables. **Order No. 0014P $7.95**

CASINO II—This is not simply a craps game, it is a tutorial program that will teach you the odds on every type of bet, so you can steer clear of the sucker bets that impoverish the unwary. Using the exact rules used at the MGM Grand Hotel in Las Vegas, you'll play under actual gambling house conditions. Get the edge you need to "get lucky." **Order No. 0015P $7.95**

CHECKERS & BACCARAT—Using International Rules, you'll play *CHECKERS with your computer and the computer will keep score, time the moves and even tell you when to jump (it'll be so busy, you may have an edge!); *BACCARAT—gives you the choice of playing Las Vegas or Blackjack style and the computer will deal the cards, figure the payoff and keep track of your bankroll. **Order No. 0022P $7.95**

ORDER YOUR INSTANT SOFTWARE TODAY!

Just Call Toll-Free 1-800-258-5473

*A trademark of Tandy Corporation
**A trademark of Apple Computer Inc.
***A trademark of Commodore Business Machines Inc.

WRITE FOR OUR NEW INSTANT SOFTWARE CATALOG

We Guarantee It!

Instant Software Guarantee

OUR PROGRAMS ARE GUARANTEED TO BE QUALITY PRODUCTS. IF NOT COMPLETELY SATISFIED YOU MAY RETURN THE PROGRAM WITHIN 60 DAYS. A CREDIT OR REPLACEMENT WILL BE WILLINGLY GIVEN FOR ANY REASON.

✓40

Instant Software™

PETERBOROUGH, N.H. 03458 603-924-7296

Program B continued.

```
1480 OUT M0,CR
1484 REM
       AND THEN THE CHECKSUM
1490 IF (INP(M1) AND TE) = 0 GOTO 1490
1500 OUT M0,CS                          'SEND CHECKSUM
1502 PRINT L$
1505 IF (INP(M1) AND CD) = 0 GOTO 1670
1510 IF (INP(M1) AND RRF) = 0 GOTO 1505
1520 C=INP(M0) AND 127
1530 IF C=ACK GOTO 1320
1540 IF C=NAK GOTO 1710
1550 PRINT CHR$(C);
1560 GOTO 1510
1570 L$ = "***** END OF FILE *****"
1580 DF=TRUE
1590 GOTO 1350
1600 OUT M2,0                           'HANG UP PHONE
1610 PRINT L$                           'STILL SAYS EOF
1620 CLOSE                              'LIKE A GOOD BOY
1630 GOTO 1200
1640 IF (INP(M1) AND TE) = 0 GOTO 1640
1650 OUT M0,ACK
1660 GOTO 1350
1670 PRINT "LOST CARRIER -- HANGING UP"
1680 OUT M2,0
1690 CLOSE
1700 GOTO 1200
1710 IF (INP(M1) AND TE)=0 GOTO 1710
1715 T=3*TC:GOSUB 10520
1720 OUT M0,ACK
1730 GOTO 1350
10000 REM SUBROUTINE WAITS FOR PHONE TO RING, ANSWERS, AND AWAITS CARRIER
10010 PRINT "WAITING FOR PHONE TO RING"
10020 IF INP(M1) AND RI GOTO 10020      'WAIT FOR RI
10030 PRINT "THE PHONE IS RINGING"
10040 IF (INP(M1) AND RI) = 0 GOTO 10040        'WAIT TIL END OF RING
10050 OUT M2,OH+TXE+(B3 AND BRS)                'ANSWER & TURN ON CARRIER
10060 PRINT "WAITING FOR CARRIER DETECT"
10070 FOR I=1 TO 150            'GIVE HIM 15 SECS TO RAISE CARRIER
10080 IF INP(M1) AND CD THEN RETURN
10090 T=TC:GOSUB 10520          '100 MSEC EACH PASS THRU LOOP
10100 NEXT I
10110 OUT M2,0                  'HANG UP PHONE
10120 PRINT "NO CARRIER -- GIVING UP"
10130 RETURN
10140 REM END OF PHONE ANSWERING SUBROUTINE
10510 REM TIMING LOOP -- IT IS CALIBRATED USING MODEM CLOCK
10520 FORZ=1TOT:IFINP(M1)ANDXTTHENRETURNELSENEXTZ
10530 RETURN
```

Program C. File Getter program.

```
5 REM             FILE GETTER PROGRAM

10 DEFINT A-Z    'MAKE ALL VARIABLES INTEGERS FOR SPEED
15 CLEAR 2000           'MAKE ROOM FOR SOME STRINGS
20 REM NAME THE MODEM FUNCTIONS
30 M0=128:M1=M0+1:M2=M1+1               'DEVICE ADDRESSES FOR MODEM
40 RI=128:CD=64:OE=16:FE=8:PE=4:TE=2:RRF=1      'STATUS BITS
50 PI=16:SBS=8:LS=2:EPE=1                       'UART CONTROL BITS
60 OH=128:RD=32:ST=16:BK=8:MS=4:TXE=2:BRS=1     'MODEM CONTROL BITS
70 TRUE=-1:FALSE=0:YE$="YES"                    'INSERT SOME ENGLISH
80 REM SET THE DEFAULT OPTIONS
90 B3=FALSE:PARITY=TRUE:EVEN=TRUE:LNG=2
100 REM
      CALIBRATE THE TIMING LOOP
110 T=2000:XT=TE                'PUT LOOP IN CALIBRATE  MODE
120 OUT M2,0:OUT M1,3*LS*EPE            'AT 110 BAUD, 1CHAR TAKES 100 MS.
130 OUT M0,0:OUT M0,0           'FILL THE UART TRANSMIT REGISTERS
140 GOSUB 10520         'RETURNS WHEN ONE HAS BEEN CLOCKED OUT
150 TC=Z:XT=0                   'TC IS # OF ITERATIONS FOR 100 MS.
155 REM
      SET UP TO GET THE FILE
160 OUT M1,(PI AND NOT PARITY)+(LS*LNG)+(EPE AND EVEN)
900 ACK=6:NAK=21:CR=13  'DEFINE THE NECESSARY CONTROL CHARACTERS
950 EF$="***** END OF FILE *****"       'END OF FILE MESSAGE LINE
1000 ME=OE+PE+FE
1010 PRINT "FILE RECEIVING PROGRAM"
1020 INPUT "FILENAME";F$
1030 OPEN "O",#1,F$
1040 L$=STRING$(150,0)
1050 GOSUB 10150
1060 IF (INP(M1) AND CD)=0 GOTO 1010
1070 PRINT "CONNECTION ESTABLISHED"
1075 REM
      RECEIVE A LINE
1080 I=1
1085 WC=250'    SET UP A TIMEOUT COUNTER
1090 IF INP(M1) AND RRF GOTO 1120
1100 WC=WC-1
1110 IF WC THEN GOTO 1090 ELSE GOTO 1280
1120 IF INP(M1) AND ME GOTO 1310
1130 C=INP(M0) AND 127
1140 IF C=CR GOTO 1175
```

More →

break and 39 percent make with a pulse rate of from 8 to 11 pulses per second. In fact, all but the oldest and crankiest of exchanges will take pulses faster than this. If you experiment with dialing rates, keep in mind that you *will* dial some wrong numbers (i.e., don't test your program at 3 AM).

The pulses are created by the loop from lines 810 to 860 with J counting the pulses. Line 870 introduces a 1/2 second delay between digits. The code from line 900 on waits for a carrier (much like the code in the answering routine), except that if it fails, it gives the operator the option of redialing the same number.

General Suggestions

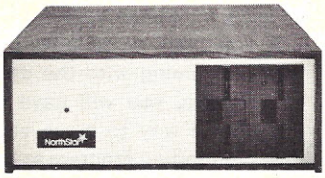
Anytime you are testing new auto-dialing programs, remember that bugs in the program can call wrong numbers. Monitor your program closely when testing and stop it if you know it's dialing a wrong number. Either MASTER RESET or EXTERNAL CLEAR (if your machine has this button) will make the modem hang up immediately (power off will also). On most systems, EXTERNAL CLEAR will have few other effects, and the program will continue to run.

When modifying the data transfer loop at lines 380-440, remember that at 300 baud your program will have to deal with each character received in 33 milliseconds or less. A long BASIC statement can easily take over 10 milliseconds to execute, especially if it must perform floating-point arithmetic. The DEFINT statement at the start of the program is essential. If all the arithmetic were floating-point, this program would have difficulty keeping up at 110 baud, not to mention 300 baud.

Any code that you plan to use here should be timed by putting it in a loop where it will be executed several hundred times and timing it with a watch, etc. First, time the loop without your new code and then with it so that you can subtract the time for executing the loop alone.

LOWEST PRICE - BEST QUALITY

NORTH STAR



North Star Horizon 2

2-5¼ Disk Drives
32K Double Den
Factory assem. & tested
Factory guaranteed
List 3095

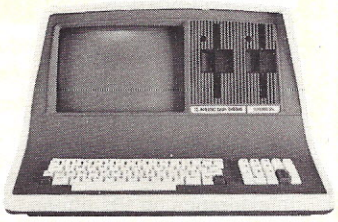
only **$2274**

POWERFUL NORTH STAR BASIC FREE
SUPERB FOR BUSINESS & SCIENCE

FACTORY ASSEMBLED & TESTED	LIST	ONLY
HORIZON-1-32K-DOUBLE DEN	$2695	$1994
HORIZON-2-32K-QUAD DENSITY	3595	2674
HORIZON-2-64K-QUAD + HARD DISK	9329	7149
HORIZON RAM ASSM	16K = $389.	32K = $579
HORIZON RAM KIT	SALE! 16K = $314	32K = $469
HORIZON DISK DRIVE SALE DOUB DEN ·	SAVE!	315
NORTH STAR HARD DISK 18 Mb	4999	3939
PASCAL-PLUS 14,18 OR 36 DIGIT PRECISION		249

SUPERBRAIN

ZENITH



SUPERBRAIN QD 64K
List $3995 only $2995

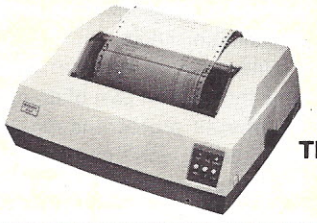


Z-89 48K
List $2895 only $2299

TERMINALS Z-19 $739

INTERTUBE III only **$725**

DIP-81 PRINTER only **$425**

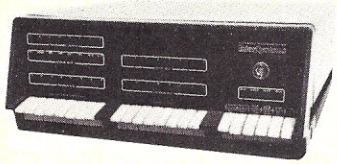


MICROTEK $675

NEC PRINTER $2699
TRACTOR, THIMBLE, RIBBON

InterSystems

ITHACA INTERSYSTEMS 2A



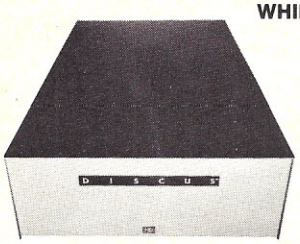
Z-80A CPU 4 MHz
64K Dynamic RAM
Front panel
V I/O—with interrupts
FDCII Disk Controller
20 slot motherboard

List $3595 You Pay Only **$2995**

PASCAL/Z + THE FASTEST PASCAL $375
GET READY FOR ITHACA'S Z-8000
8086 16 BIT CPU & SUPPORT CARD SEATTLE $575

MORROW 8" DISK

DISCUS 2D + CP/M® 600K ONLY $938
DISCUS 2 + 2 + CP/M® 1.2 MEGA B. $1259
ADD DRIVES 2D = $650 2 + 2 = $975
2D-DUAL + CP/M® + MICROSOFT BASIC = $1555
$2293 VALUE OVER 32% OFF!
WHILE THEY LAST



MORROW HARD DISK
26,000,000 BYTES!!
LIST $4995 ONLY $3995
CP/M® IS INCLUDED!

SAVE ON MEMORY AND PROGRAMS

SYSTEMS MEMORY 64K A & T 4mHz	$599	RCA-COSMAC VP-111 99 RCA-COSMAC VP-711	$199
SYSTEMS MEMORY 64K BANK SELECT	$789	COLOR! RAINBOW 385 SPECTRUM	$289
CENTRAL DATA 64K RAM	$599	EZ-80 Machine Language Tutor	$25
ITHACA MEMORY 8/16-bit 64K	$845	EZ-CODER Translates English to BASIC	$71
SEATTLE MEMORY 8/16 BIT 16K 4Mhz	$356	ECOSOFT FULL ACCOUNTING PKG	$315
SSM KITS Z-80 CPU	$221	BOX OF DISKETTES	$29
VIDEO BRD V83 4Mhz	$412	SECRETARY WORD PROCESSOR	The Best! $99
ANADEX PRINTER DP-9500-1	$1389	TEXTWRITER III Book Writing Program	$112
CAT NOVATION MODEM	$169	GOFAST NORTH STAR BASIC Speeder	Upper $71
TARBELL DISK CONTROLLER DD	$445	Which Computers are BEST? BROCHURE	FREE
ECONORAM 2A 8K ASSM	$179	North Star Documentation refundable	w/HRZ $20
NSSE 1-22 & P01 TERRIFIC PROGRAMS	ONLY $10. EACH		
NORTHWORD 294 MAILMAN 234 INFOMAN	$364		

TARBELL COMPUTER-PHONE

AMERICAN SQUARE COMPUTERS BEATS ADV. PRICES

American square Computers

56

919-889-4577 KIVETT DR. JAMESTOWN N.C. 27282 919-883-1105

® CP/M is a registered trademark of Digital Research, Inc.

Program C continued.

```
1150 MID$(L$,I,1)=CHR$(C)
1160 I=I+1
1170 GOTO 1090' WHEW! WHAT A LOT OF STUFF TO GET ONE LITTLE BYTE!
1172 REM
        RECEIVE THE CHECKSUM
1175 WC=250
1180 IF INP(M1) AND RRF  GOTO 1190
1183 WC=WC-1
1187 IF WC THEN GOTO 1180 ELSE GOTO 1310
1190 CS=INP(M0)
1195 REM
        CHECK THE CHECKSUM
1200 FOR  J=1 TO I
1210 CS=CS XOR ASC(MID$(L$,J))
1220 NEXT J
1230 IF CS<>0 AND CS<>ACK GOTO 1310
1235 REM
        NOW WE GOT A LINE, DO SOMETHING WITH IT.
1240 L$=LEFT$(L$,I-1)
1250 PRINT L$
1255 IF L$=EF$ GOTO 1410'       CHECK FOR END OF FILE LINE
1260 PRINT #1,L$
1270 L$=STRING$(150,0)
1272 REM
        NOW LET HIM KNOW WE GOT IT SO HE CAN SEND ANOTHER.
1275 CC=ACK
1280 IF (INP(M1) AND TE)=0 GOTO 1280
1285 IF (INP(M1) AND CD)=0 GOTO 1440
1290 OUT M0,CC
1300 GOTO 1080
1305 REM
        UH-OH, BAD DATA.  SEND HIM NAK, AND GET IT AGAIN.
1310 PRINT "SENDING NAK"
1311 CC=NAK
1315 T=3*TC:GOSUB 10520'        SHORT WAIT LETS GLITCH GO BY
1317 IF (INP(M1) AND CD)=0 GOTO 1440
1320 OUT M0,NAK
1330 WC=250
1340 IF INP(M1) AND RRF GOTO 1370'      WAIT FOR HIM TO ACK OUR NAK.
1350 WC=WC-1
1360 IF WC=0 GOTO 1310
1370 IF INP(M1) AND ME THEN X=INP(M0): GOTO 1340
1380 C=INP(M0) AND 127  'READ CHARACTER AND STRIP PARITY
1390 IF C<> ACK GOTO 1340
1400 GOTO 1080
1405 REM
        WE'RE ALL DONE.
1410 OUT M2,0   'HANG UP PHONE, WE'RE DONE WITH IT
1420 PRINT "FILE SUCCESSFULLY RECEIVED"
1425 CLOSE
1430 GOTO 1010
1440 REM
        HE WENT AWAY.  MIGHT AS WELL HANG IT UP.
1450 OUT M2,0'  HANG IT UP
1460 PRINT "LOST CARRIER -- HANGING UP"
1470 GOTO 1425
10150 REM
         THIS SUBROUTINE GETS A PHONE #, DIALS IT, AND WAITS FOR CARRIER
10160 INPUT "PHONE NUMBER";PH$
10170 OUT M2,OH          'TAKE PHONE OFF HOOK
10180 T=TC*20:GOSUB 10520        'WAIT 2 SECONDS FOR DIAL TONE
10190 PRINT "DIALING - ";
10200 FOR I=1 TO LEN(PH$)        'LOOP THRU PHONE NUMBER
10210 D=ASC(MID$(PH$,I,1))               'GET ONE CHARACTER
10220 IF D=42 THEN T=TC*20:GOSUB 10520:NEXT I    '*=2 SEC DELAY
10230 D=D-48
10240 IF D<0 OR D>9 THEN NEXT I 'IGNORE NON-DIGITS
10250 PRINT D;                   'PRINT DIGITS WHILE DIALING
10260 TB=TC/2
10270 TM=TC/2-4
10280 IF D=0 THEN D=10           '0 DIALS AS 10 PULSES
10290 FOR J=1 TO D               'LOOP TO FORM THE PULSES
10300 OUT M2,0                   'FORM PULSE BY GOING ON HOOK
10310 T=TB:GOSUB 10520  'PULSE LASTS 60 MSEC
10320 OUT M2,OH+MS                       'END OF PULSE
10330 T=TM:GOSUB 10520  '40 MSEC BETWEEN PULSES
10340 NEXT J
10350 T=TC*4:GOSUB 10520                 '1/2 SEC BETWEEN PULSES
10360 NEXT I
10370 PRINT
10380 PRINT "FINISHED DIALING"
10400 PRINT "NOW WAITING FOR HIS CARRIER"
10410 FOR I=1 TO 300     'GIVE HIM ABOUT 20 SECONDS
10420 T=TC:GOSUB 10520  'WAIT 100 MSEC
10429 REM WHEN WE HEAR CARRIER, TURN ON OURS AND RETURN.
10430 IF (INP(M1) AND CD)=0 GOTO 10440
10431 OUT M2,OH+MS+TXE+(BRS AND B3)'     TURN ON MODEM
10433 X=INP(M0):X=INP(M0)'               CLEAN OUT GARBAGE IN USART
10435 RETURN
10440 NEXT I
10450 PRINT "NO CARRIER -- GIVING UP"
10460 OUT M2,0
10470 INPUT "WANT ME TO TRY AGAIN";I$
10480 IF I$=YE$ GOTO 10170
10490 RETURN             'COULDN'T DO IT
10500 REM END OF DIALING SUBROUTINE
10510 REM TIMING LOOP -- IT IS CALIBRATED USING MODEM CLOCK
10520 FORZ=1TOT:IFINP(M1)ANDXTTHENRETURNELSENEXTZ
10530 RETURN
```

My timing studies indicate that it should be possible to stuff the characters into an existing string with the MID$ statement, such as MID$(I$,I,1) = CHR$(INP(M0)), but that appending to a new string such as I$ = I$ + CHR$(INP(M0)) is much too slow. It should also be feasible to put the characters into individual elements of an array as integer values.

If you plan to do anything time-consuming with the data you receive, you will have to have some way to make sure that the sending program at the far end will stop sending long enough for you to do it or you'll lose characters.

This can be most easily arranged by having the sending program wait for an acknowledgement at intervals (such as at the end of a line of text). The receiving program can then do what it has to before acknowledging. If you use parity, checksums or other error-checking methods, you may also wish to implement a negative acknowledgement that will request the sending progam to retransmit the data.

Error correction is essential if you plan to transmit such data as object programs, etc., where there will be no human operator to filter out the occasional glitches due to noise and interference on the phone line.

The Giver and Getter programs (Programs B and C) included with this package illustrate a simple implementation of such a protocol. Unfortunately, they are too complex to be run in BASIC at 300 baud. They will run acceptably at 110 baud and should serve as a useful example of the techniques needed to implement an error-checking protocol.

One note of caution: Probably the hardest part of doing a bulletproof protocol is making sure that it won't get hung up by losing data (such as an ACK or an NAK) at some unexpected time. It is generally necessary to have time-outs on everything.

Good luck and have fun. With imagination and a little work, your computer can be on-line via microwaves and satellites to most of the world.■

THE BEST IN SOFTWARE FROM COMPLEAT SYSTEMS

SERVICE INDUSTRY AND/OR NON-PROFIT ACCOUNTING

Originally written for a non-profit organization and in use for over three years. A Partner of a Big 8 accounting firm said:

"...the best accounting program I have seen...does in a few pages of output what is frequently not done in 50 pages..."

Ideal for non-profit organizations such as charities, churches, schools, professional societies, etc., and a wide range of businesses such as consultants, service shops, cleaners, domestic services, ticket or insurance agencies, amusement parlors, health clubs, or any business that principally provides a service rather than a product.

"...(its) most amazing feature is that a non-accountant can easily run the system and automatically produce all standard ledgers and reports"

GENERAL LEDGER AND PAYROLL

Write for our Free Booklet describing the many unique features.
Requires 1 disk, 48K Z-80, CP/M* or 32K TRS-80* mod 1, 2 disk
CHRISTMAS SPECIAL! get both programs for 30% off; good until January 31, 1981

VISA master charge THE INTERBANK CARD

Master Charge or VISA accepted. CA residents add 6% tax

SADE: SECURITY AND DATA ENCRYPTION

This set of programs is designed to be a user security system.
It is the closest thing to ABSOLUTE SECURITY that there is! With a billion billion (10^{18}) combinations, there is not a system anywhere that compares to it. NO ONE, not even us, can break the user chosen code, even if they have your disk and system!*
SET IT AND FORGET IT. After start up, the system works automatically (transparent to the user) and automatically interfaces with all user programs. Some typical uses would be:
—Proprietary product information; eg. formulas, parts list, patent data, program source code, etc.
—Sensitive sales or financial information; eg. tax records, gross sales, profits, etc.
—Confidential employee or client information; eg. payroll, client list & data, etc.
—Time sharing, multi-user, or distributed processing. All information stored with central computer can be coded.
Specifications:
—Uses top of memory; 512 bytes for TRS-80 and 1K for CPM.
—Codes or decodes a record in less than one second.
—All memory pointers are adjusted for automatic use with/by other programs.
—Includes manual and disk with complete instructions.
—Version 1 for TRS-80 model I: requires 1 disk, 16K. $49.95
—Version 3 for CPM: requires 1 disk, 24K CPM. This latest version allows a mixed system of coded and uncoded files for greater speed, versatility, and security. $99.95

$1000 FREE TO FIRST TO DECODE OUR SAMPLE MESSAGE!

*All cryptographic systems, except one time only keys, are theoretically breakable. However, we are so sure that our system is unbreakable that we are offering a $1000 rebate to the first customer who can decode our sample message included with the program.

Compleat Systems ↙94

9551 Casaba Ave., Chatsworth, CA 91311
213-993-1479

TRS-80 and CPM are registered trademarks of Tandy Corp. and Digital Research, Inc.

CP/M®1 – based Business Software for TRS-80®2 computers on . . . . . the fastest Mod-II CP/M with the most features!!!

- Over 610,000 bytes/disk
- Downloading package included
- 1,200 baud operation of serial printers without data loss
- Single drive backup

MOD-II CP/M $250.00

- Mixed single/double density on any of 4 drives (even a 1-drive system)
- Ultra-fast disk operation
- Emulation of cursor addressing for any of several "dumb" CRTs

MOD-I CP/M $150.00

- Auto-LF printer support & ASCII top-of-form software (LPIII)
- Supplemental document describing our implementation
- User-settable function keys

CBASIC2®3 (Mod I or II) $110.00

The following software for Mod-II CP/M only unless otherwise stated (*-requires CBASIC2):

RM/COBOL®4 – Only COBOL for CP/M with alternate keys (multi-key ISAM), CRT screen handling, interactive debug, Z80 code, and the most useful Level 2 features. **Compatible with Tandy's COBOL–but runs faster!** $495.00

PMS (Property Management System) - Interactive, menu-driven system includes full G/L, budgeting, cash journal, delinquency list, tenant activity/rent roll, complete audit trail and reports on vacancies, lost rent, and vendors $650.00*
demo disk & manual 75.00*

APH (Automated Patient History) - General-purpose question-asking, answer-printing system furnished as self-administered review-of-systems general patient history (Mod-I also) ... $175.00*

MAGIC WAND®5 – Full-feature word processing, true proportional spacing, file merging, and use of full-screen editor for source programs or data $400.00

RPA (Residential Property Analysis) - Analyzes income and expense, financing, taxes, inflation and depreciation on home, condo, or apartments over a user-selectable time. Shows payoff in terms of ROI, Cap rate, cash-on-cash. Amortization schedules and worksheet $300.00*
demo disk & manual 35.00*

RBC (Rent/Buy Comparison) - Sales or investment tool to compare renting and savings account investment vs. purchasing a particular property $250.00*
demo disk & manual 35.00*

Osborne & Assoc. CBASIC source programs (Mod-I also):

Payroll w/Cost Accounting $250.00*
Accts. Payable/Accts. Receivable $250.00*
General Ledger w/Cash Journal $250.00*
O&A CBASIC Books (ea.) ..... $ 20.00

Verbatim®6 media: (Qty. 100 prices)

5¼" single density ..... $2.50 ea.
8" certified double density ..... $4.00 ea.
8" single density ..... $ 3.00 ea.
450' tape cartridges ..... $20.00 ea.

CYBERNETICS INC
8041 Newman Ave., Suite 208
Huntington Beach, CA 92647
(714) 848-1922

Registered trademark of:
®1Digital Research
®2Tandy Corp.
®3Compiler Systems, Inc.
®4Ryan-McFarland Corp.
®5Small Business Applications, Inc.
®6Verbatim Corp.

Distributed in U.K. by:
Microcomputer Applications Ltd.
11, Riverside Court,
Caversham, Reading, England
TEL: (0734) 470425

↙Reader Service—see page 226

Finishing School For Programmers

By David C. Goodfellow

For centuries, young men and women have been sent to private schools to be honed and polished. Computer owners now have something similar for their programs—Instant Software.

This school doesn't polish the program itself—it polishes the programmer by showing him where to apply the polish.

A year ago I sent a Client File/Billing program to ISI for possible marketing. They agreed that the program had merit, but asked me to make a few improvements. Their letter included criticisms from three independent associate editors.

The criticisms pointed to 23 items that needed work. This was a surprise. I didn't think the program was perfect, but I didn't realize it was complex enough to even have 23 elements.

I began at once to make improvements, only to find that a complete rewrite would be easier. Even though I changed little, the rewrite took me around 100 hours. The reason was simple: I didn't know how to do many of the things requested. I spent much of the time educating myself.

Programming Tips

How to round off dollars and cents accurately. The routine I had been using added a penny when no round-off was needed. To avoid this, I had structured my bills so that round-off was always necessary. Now the program does it right, with no hedging on my part.

How to line up dollar amounts on the decimal point. I had been letting the chips fall where they may, and they looked more like buffalo chips than anything else.

How to position number columns exactly. The pre-ISI version positioned columns by counting spaces to the right of a tab. Trouble was, varying lengths of material to the left of the tab could change the tab position, leaving me in left field. The new version positions from the right edge of the paper and (to a point) doesn't care about the length of the preceding material on that line.

This school polishes the programmer by showing him where to apply the polish.

How to delete a record from a disk file and free up the space allotted it. The pre-ISI version simply filled the record with nulls. This worked, at least to the extent that the unwanted data were gone. But it printed a lot of empty lines in hard copy, slowed down searches by requiring the computer to search empty records and sprinkled the disk with unusable records.

The new version rewrites the file, renumbering the valid records, and throws away the empties.

How to spruce up the display, speed up the operation and communicate with the user. The program had always been easy for me to use, because by the time I had finished writing it I was thoroughly familiar with its operation. It hadn't occurred to me that strangers would have more of a problem. The ISI editors let me have it for that, and I quickly learned what "user-oriented" was all about.

Lesson Learned

Client/File Billing (version two) went back to ISI last week, physically fit, fingernails cleaned, hair combed and shoes shining. Royalty checks, fame and fortune fill my dreams. But even if the program never earns me a nickel, the experience has been invaluable. It has given me a program exactly suited to my own needs and has made a better programmer of me.

ISI didn't teach me any programming tricks. It just gave me the incentive to learn and to make the program approach its potential excellence.

ISI is better than prep schools for children. This school polishes the father, allowing him to polish the child, and costs nothing but the time and effort required for any worthwhile project. ■

David C. Goodfellow, 13026 13th S.W., Seattle, WA 98146.

DR. DALEY OFFERS SOFTWARE FOR EVERYONE

DATA BASE

The data base package allows total user control over the contents of each entry in the file. Features user selectable record size from 5 to 242 characters per record, statistical and plotting package, output with WORDPRO files or printer. Includes full user definable output formatting. With optional indexing routine can produce a comprehensive index of a data set.

$299.95

Index 99.95

MAIL LIST

This powerful mailing list package features a variety of options for producing labels. It includes user defined file structure and label format. Label format can list to the printer or to WORDPRO format files.

$159.95

SOFTWARE LIBRARY

Hundreds of schools and individuals have purchased this package for use as an educational tool or just plain fun. It contains 50 (yes fifty!) programs. This ranges from our famous TREK 3 and horse race to fun learning programs for children to checkbook and a micro mail list program with lots in between. At about $1.40 per program how can you miss?

Cassette $69.95
Diskette 79.95
For APPLE II or PET

For PET or CBM 2000 or 8000 series with 32K memory please specify your machine configuration.

Charge to your MC/VISA





DR. DALEY'S SOFTWARE ↙34

425 Grove, Berrien Springs, Michigan 49103
Phone (616) 471-5514 Sunday-Thursday noon to 9 p.m. Eastern Time

DG/H8 — THE TOTAL SYSTEMS CONCEPT

THE DG-80 ZILOG Z80 BASED CPU — $249.00 (Documentation Only $25.00)

FEATURES:
• Compatible with Heath® H8 hardware and software • Z80 CPU — Enhanced instruction set • Provisions for up to 8K ROM/EPROM and/or 4K RAM • Jump-On-Reset to any 1K boundary • DIP switch selectable wait states for any or all 8K blocks of memory • All Z80 interrupt response modes available • Interrupt Acknowledge and Dynamic Memory Refresh signals available on bus • Frequently selected options by DIP switch or solderless jumper • Machined contact gold sockets for ROM/EPROM, RAM • Includes many advanced features for future expansion • Assembled, tested and guaranteed • Extensive operations manual and Z80 PROGRAMMING MANUAL
90 DAY WARRANTY

NEW! 5 VOLT ONLY VERSION 64K RAM — DG-64D5

Uses Single Supply 5 Volt Dynamic RAMS. Call for further information.

DG-64D BEST RAM EVER AVAILABLE FOR THE H8.

FEATURES:
• Up to 64K bytes capacity Dynamic RAM • Hardware bank selectable in 8K increments • Software bank selectable in 16K increments through I/O port • On-board bank select/CPU ROM disable port, addressable to any of 256 I/O addresses • Up to 8 boards controllable through one I/O port (allows page mode operation) • On-board transparent refresh for 8080 or Z80 microprocessor backed up by asynchronous refresh which maintains memory contents during extended wait states • 4 MHz operation with no wait states required • Low power consumption—less than 8 watts • Assembled, tested, & burned-in • 90 DAY WARRANTY • 64K–$529.00; 48K–$480.00; 32K–$431.00; 16K–$382.00; ØK–$333.00; Documentation Only–$15.00

DG-FP8 — $69.95

Monitor/Utility package for DG-80 CPU provides functions of PAM-8 as well as the following:
• Split Octal or Hexidecimal Entry and Display • Z80 monitor features such as display alternate register sets, display index registers, • "Shorthand" display of memory contents pointed to by general purpose registers • Supports STANDARD CP/M provided by D-G as well as HDOS • Provides firmware support for DG-ADP4, 4 MHz hardware • Includes single step features

Documentation Only - $15.00 (Source Listing Not Included)

DG-ADP4 — $19.95

Plug-in hardware modification to allow operation of the Heath® H17 disk system with the DG-80 at 4 MHz. Requires the use of the DG-FP8 firmware package.

STANDARD CP/M Ver 2.2 $130.00

16K CHIP SETS $49.00

(8-4116 Type Dynamic RAMS) for DG- 32D, DG-64D, Apple®, TRS-80®, H88/ 89®, and Pet®

DG-CMD1 — $29.95

ROM disable port for use with the Heath® H8 computer. Addressable to any of 256 I/O ports. Allows the use of a full 64K of RAM when used in conjunction with the DG-80 CPU and the DG-FP8 hardware/firmware package (NOT REQUIRED FOR SYSTEMS UTILIZING THE DG-64D MEMORY BOARD)

DG-FP8/DG-ADP4 – TOGETHER – $79.95

Save on Combination Purchase — Reg. $89.90

DG-32D — 32K — $339.00 — 16K — $287.00 — ØK — $235.00 — DOCUMENTATION $12.00

CP/M is a registered trademark of Digital Research of Pacific Grove, California. Heath, HDOS, H8, H88/89 & PAM8 are registered trademarks of the Heath Company. Z80 is a registered trademark of Zilog Corp. PET is a registered trademark of Commodore. Apple is a registered trademark of Apple Computer. TRS-80 is a registered trademark of TANDY Corp.

D·G ELECTRONIC DEVELOPMENTS CO. ↙145

Ordering Information: Products listed available from DG Electronic Developments Co., P.O. Box 1124, 1827 South Armstron, Denison, Tx. 75020. Check, Money Order, VISA or Master Charge accepted. Phone orders (charge only) call (214) 465-7805. No COD's. Freight prepaid. Allow 3 weeks for personal checks to clear. Texas residents add 5%. Foreign orders add 30%. Prices subject to change without notice.

↙Reader Service—see page 226

CALENDAR

AMUS Convention

The first annual Alpha Micro User's Society Convention will be held January 17 through 23 at the Deauville Hotel in Miami Beach, FL. The convention will feature seminars; conferences; demonstrations; and meetings for businessmen, programmers and analysts based on the Alpha Micro system. For further information, contact William L. Miller & Associates, 8389 S.W. 151 St., Miami, FL 33158.

Call for Speakers/Session Leaders

A call for speakers and conference session leaders has been issued for the 6th West Coast Computer Faire to be held in San Francisco's Civic Auditorium, April 3-5, 1981. Those interested can obtain further details from Computer Faire, 333 Swett Road, Woodside, CA 94062.

Othello Tournament

An Othello tournament open to individuals or teams will be held at the University of California at Santa Cruz on January 17 and 18. To register, send your name(s), program designation and equipment description by Jan. 10 to Professor Peter W. Frey, 421 Kerr Hall, University of California, Santa Cruz, CA 95064.

Educational Software Symposium

An educational software symposium will be conducted on January 17 and 18 at the Holiday Inn in Bridgeport, CT. Seminars by leaders in the educational software field, as well as exhibits and discussions, will be featured. Contact Monica Kantrowitz, president, Queue, 5 Chapel Hill Drive, Fairfield, CT 06432.

MAGIC WAND™

$325.

This powerful word processor (new version 1.1) is now ready for

apple computer

We stock most CP/M 8" single density disk formats (inc. TRS, Vector, North Star, etc.), plus Apple. We customize Magic Wand for most systems: specify CPU, terminal, printer.

Our fully interactive **Mail Magic™** mail management software, with 14 user defined fields and full merge and sort capability is available for **$149.** CP/M required. ✓133

COMPUTER CTY
PO Box 60284 K
Houston TX 77205
(713) 821-2702

TM Magic Wand is a trademark of Small Business Applications

CORRECTIONS

Robin B. Moore has forwarded the listing changes for the Editor and Demo programs that he neglected to include with the article ("Graphics Character Generator," August 1980, p. 106). See Listing 1.

He also notes that if Listing 2 in the article is entered using the Apple's mini-assembler, it will not assemble as shown. This is due to a bug in the Microproducts assembler that he used. To avoid the problem, substitute the following two lines in Listing 2:

```
083E-8D   1E   10   STA $101E
0841-AD   1F   10   LDA $101F
```

Then enter the Apple's Monitor program and patch as shown below:

```
* 840: 0 (carriage return)
*843: 0 (carriage return)
```

Save the program

One zero can make quite a difference, as Merrill Lessley ("Build a Computer Controlled Triac Dimmer," August) points out. The end of the second paragraph in his article (p. 92) should read "2000 watt load," not "200."

When saving a program on the PET, the "ending address" that must be inserted into page zero must be the address *after* the last address you wish to save. As described in "PET Mini Monitor" (October), the last byte of data will not be saved. The following correction should be substituted in Table 3 on p. 89, as well as on p. 91:

```
00E5 XX 3B enter ending address Lo byte plus 01
```

Maybe a better way of stating "ending address" would be "last address plus one."

DEMO PROGRAM

```
ADD:     507 X0=Y0=COLR: INIT = -12288: POSN = -11527: LINE = -11500: PLOT = -
             11506
CHANGE:  150 Y0=9: X0=7: CALL POSN: X0=273: CALL LINE
         240 X0=0: Y0=34: CALL POSN: X0=69: CALL LINE
         250 Y0=121: CALL POSN: X0=0: CALL LINE
         380 FOR J=1 TO 20: Y0=110+Y(3): X0=138+X(3): CALL POSN
         390 FOR I=0 TO 3: Y0=110+Y(I): X0=138+X(I): CALL LINE
         520 LINK=2048: HOME=-936
         540 POKE TL,0: POKE TH,9: COLR=255
```

EDITOR PROGRAM

```
CHANGE:  430 CALL INIT: COLR=255: FOR I=0 TO 8: X0=3: Y0=3+16*I: CALL POSN
         440 X0=171: CALL LINE: NEXT I: Y0=157: X0=3: CALL POSN: X0=171: CALL
             LINE
         450 FOR I=0 TO 8: X0=3+14*I: Y0=3: CALL POSN: Y0=131: CALL LINE: NEXT I
         460 X0=171: Y0=3: CALL POSN: Y0=157: CALL LINE
         470 X0=115: CALL POSN: Y0=131: CALL LINE: X0=3: CALL POSN: Y0=157:
             CALL LINE
         570 Y0=3: X0=196: CALL POSN: X0=257: CALL LINE: Y0=77: CALL LINE
         580 X0=196: CALL LINE: Y0=3: CALL LINE
         590 Y0=5: X0=199: CALL POSN: X0=254: CALL LINE: Y0=75: CALL LINE
         600 X0=199: CALL LINE: Y0=5: CALL LINE: RETURN
        1660 X0=Y0=COLR=I=J=K: PAGE=806: TBLE=2304: DIM K$(40),N$(26): D$="":
             REM CNTRL-D
        1680 INIT=-12288: LINK=2048: HOME=-936: LINE=-11500: POSN=-11527:
             PLOT=-11506
```

Listing 1. Changes to CHAR-GRAF for Programmer's Aid #1 ROM.

DEALER DIRECTORY

Phoenix, AZ

Most complete electronics store in Arizona. Books, magazines, prototyping equipment, building supplies & components of all kinds. Free Catalog. Open six days a week. **Tri-Tek Inc., 7808 N. 27th Ave., Phoenix, AZ 85021.**

El Monte, CA

Ohio Scientific specialist in the San Gabriel valley serving greater Los Angeles. Full product line on display. Specializing in business computers. In-house service. Custom programming. Terminals. Printers. Open Mon–Sat, 9 AM–7 PM. **Computer & Video, 3380 Flair Dr., Suite 207, El Monte, CA 91731, 572-7292.**

San Jose, CA

Bay area's newest computer store. Featuring the new Texas Instruments TI 99/4 home & business computer. Software for TRS-80, Apple, PET, etc. Magazines. **Hobbi-Tronics, 1378 S. Bascom Ave., San Jose, CA 95128, 998-1103.**

San Jose, CA

New and used computer products—specializing in S-100 boards, printers, drives, chassis and complete systems, as well as supplies and parts —Imsai, Tandon, Diablo—5000 sq. ft. **W/W Component Supply, Inc., 1771 Junction Ave., San Jose, CA 95112.**

Denver, CO

Tantalizing software for your microcomputer. We have software applications for both home and business. Ask for prices on diskettes, tapes, custom forms, checks, etc. **The Software Gourmet, 1111 South Pearl St., Denver, CO 80210, 777-8890.**

Sarasota, FL

Dynabyte computer systems, Hazeltine and NEC, Word-Star, Structured Systems accounting. Consulting, training, sales, service. **Glisco, Inc., 4001 Roberts Point Rd., Sarasota, FL 33581, 349-0200.**

Sarasota, FL

Real-Time/Industrial Software Engineering Consultants. Top-down design and structured techniques utilized. **Advanced Computer Concepts, Inc., PO Box 15710, Sarasota, FL 33579.**

Tampa, FL

Apple Computer sales and service. S-100 boards from SSM, Godbout, Thinker Toys, California Computer Systems. Computer books and magazines. **AMF Microcomputer Center, Inc., 11158 N. 30th Street, Tampa, FL 33612, 971-4072, 977-0708.**

Aurora, IL

Microcomputer systems for home or business; peripherals, software, books & magazines. Apple, Hewlett-Packard, North Star, Cromemco systems. IDS-440G printer w/Apple graphics, New HP-85 & HP calculators. **Farnsworth Computer Center, 1891 N. Farnsworth Ave., Aurora, IL 60505, 851-3888.**

Chicago, IL

Computer Hardware/Specialists for home and business. Largest selection of computer books, magazines and copyrighted software in Illinois. Experienced factory-trained service department. Feature Apple, Alpha Microsystems and Hewlett-Packard calculators and accessories. **Data Domain of Schaumburg, 1612 E. Algonquin Rd., Schaumburg, IL 60195, 397-8700.**

Chicago, IL

Brand new lowest prices, never undersold, postpaid in USA—Teletype 43 keyboard printers, Okidata & Integral Data printers, SS-50 bus computers, peripherals & business software. **Data Mart, 914 East Waverly Street, Arlington Heights, IL 60004, 398-8525.**

Garden City, MI

Books, Magazines, Hardware, and Software for Apple, Northstar, TRS-80, and PET. **Computer Center, 28251 Ford Rd., Garden City, MI 48135, 425-2470.**

Hannibal, MO

Ohio Scientific products, modifications, service, software. 8" disk for C1p, C4p. Process control specialist. **E&I Technical Service, 5300 Paris Gravel Road, Hannibal, MO 63401, 248-0084.**

Kinston, NC

"Rent-All" CP/M software for multiple rental locations accommodates 7000+ items. Shows profitability by item/store; moves items between stores by demand...more. Dealer inquiries invited. **Southern Digital Systems, Inc., Suite 806A, Vernon Park Mall, Kinston, NC 28501, 527-4691.**

Portland, OR

Ohio Scientific specialists for business and personal computers. Local service. Terminals, printers, custom programming. Full OSI product line on display! 10 AM to 6 PM M–F. **Fial Computer, 11266 SE 21st Ave., Milwaukie, OR 97222, 654-9574.**

Milwaukee, WI

Specializing in the CBM-PET, business, personal, educational, industrial, telecomputing systems. Consulting, modems, printers, books, accessories, magazines, supplies, peripherals, timesharing. Factory authorized service. Convenient freeway access. **PETTED micro systems, 4265 W. Loomis Rd., Milwaukee, WI 53221, 282-4181.**

Call or visit the dealer nearest you!

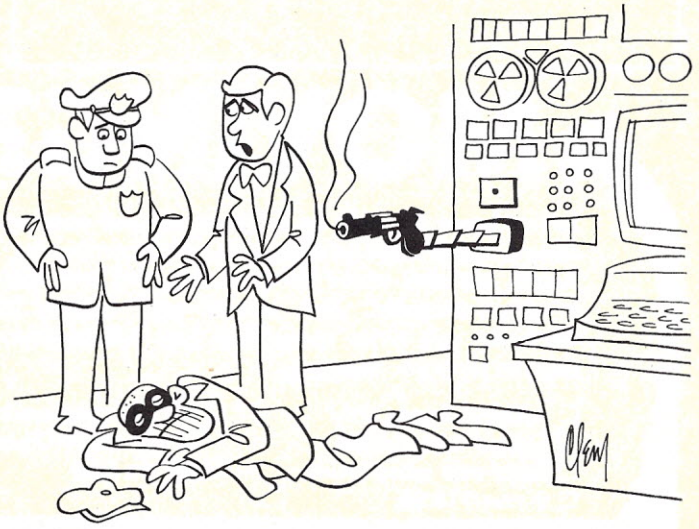
Dealers: Listings are **$15** per month in prepaid quarterly payments, or one yearly payment of **$150**, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-7138 or write *Kilobaud MICROCOMPUTING*, Ad Department, Peterborough NH 03458.

NEXT MONTH:

Kilobaud Microcomputing travels around the world next month as it looks at business, educational and hobbyist applications in foreign countries. Included among the topics to be examined in this international issue are:

- Computers revolutionizing Egypt
- Microcomputing industries flocking to Ireland
- Government support of private microcomputing companies in India
- Spreading the good word of microcomputing in Indonesia and Puerto Rico
- An Englishman's view of Silicon Valley
- Videotext systems in England and the U.S.
- The popularity of the PET in France
- Computerists in Argentina and Australia coping with high prices and the lack of availability of microcomputing parts

You'll also be entertained as Publisher Wayne Green recounts his most recent experiences in the Far East and gives his impressions of the latest developments in microcomputing from that part of the world.



"He made the mistake of pressing the RUBOUT key."

PACIFIC OFFICE SYSTEMS

COMPUTER INTERFACES & PERIPHERALS

- **POS-100 NRZ1 TAPE DRIVE CONTROLLER/FORMATTER** — Now your micro can read and write IBM/ANSI compatible NRZ1 format 9-track magnetic tapes. The POS-100 consists of S-100 bus card, 6' ribbon cable, tape drive controller card, cable to Pertec-Standard NRZ1 Tape drive, plus documentation and Z-80 or 8080 software (specify). Power is derived from tape drive and S-100 bus. Ship Wt.: 10 lbs. Suggested Retail Price $995.00
- **POS 103/202 "MIX or MATCH" MODEM** — Unique POS control design permits use in one housing of both Bell-compatible 103 (0-300 baud) and 202 (0-1200 baud) modem modules originally made by VADIC Corp. for a telephone company subsidiary. FEATURES: RS-232 serial Interface, auto-answer, auto-dial, LED display, telephone line interface via acoustic coupler, manual DAA, or auto-answer DAA (sold separately). FULLY ADJUSTED; no special tools required. 3,000 mile range over standard dial-up telephone lines. Ship wt.: 15 lbs.
  PRICES . . . . . POS 103 Modem — $199.95; POS 202 Modem — $299.95; POS 202 Modem w/Auto-Answer — $349.95; POS 103/202 Modem — $499.95; FCC-Approved Auto-Answer DAA — $125.00; Acoustic Coupler — $29.95.
- **POS DAISY-WHEEL PRINTER INTERFACE for TRS-80** — Will drive Diablo HyType I, HyType II, and Qume Q and Sprint 3 printers. Includes 1K user-available memory for custom print routines (such as graphics, bidirectional printing, etc.). Programmed to respond to print commands from BASIC ELECTRIC PENCIL™, and SCRIPSIT™ software. Draws its power from printer. Ship wt.: 5 lbs. Price $250.00
  Cables, each (Specify HyType I, HyType II, or Qume) . . . . . $ 25.00
- **POS ASCII INTERFACE for IBM I/O SELECTRIC** — This Centronics-style parallel printer interface will drive an IBM Model 731 or 735 I/O typewriter (EBCD and Correspondence codes). No software needed. Features on-board EPROM which holds up to 8 ASCII-to-IBM code tables for different type spheres. Closed-loop operation runs at maximum printer speed; stops and starts on a single character without loss of data. Requires +12VDC and ±5VDC power source. Ship wt.: 5 lbs. Price $249.95
  Power Supply (±5VDC, +12VDC, +24VDC for Solenoids on Printer) . . . .$ 49.95
- **CONVERT OFFICE SELECTRIC TO I/O TYPEWRITER** — Kit includes assembled solenoids, switches, wire harness, magnet driver PCB plus instructions for installation and mCPU interface. Price $150.00
- **"FORMALINER" Variable Width Forms Tractor** for 15" Selectrics . . . $95.00
- **GTE Model 560 ASCII SELECTRIC I/O Terminal** — With RS-232 Serial Interface and digital cassette deck for use as memory typewriter. Ship wt.: 100 lbs. Price, tested and adjusted $1,195.00
- **POS ASCII IBM SELECTRIC PRINTER** — 15" Selectric from GTE terminal cleaned and adjusted with POS Centronics-style ASCII printer interface. UC/LC, carbon and fabric ribbons. Compatible with TRS-80, Apple, SOL and other CPU parallel printer ports. Ship wt.: 75 lbs. Price $895.00

PACIFIC OFFICE SYSTEMS ✓153
918 Industrial Avenue Palo Alto, CA 94303 (415) 493-7455

MICRO QUIZ

(from page 23)

Answer: 8.

S is incremented whenever N is divisible by index variable D. Thus, S equals the number of factors of N, excluding 1 and N.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, Kilobaud Microcomputing, Peterborough NH 03458.** Do not include any other material with your ad as it may be delayed.

For Sale: Kim-1 with power supply 5 & 12 V, $125. Kimsi S-100, $75. 2 Mem-1 8K RAM by WMC, $75 ea. Ithaca Audio: EROM 16K with 12-2708s, $70: I-A video display bd, 64 × 16 char, $50. 64 2102 RAM chips, $.50 each. Call Steve at 612-459-0533 after 6 PM.

Sol Terminal Computer, word processor, mailing list, BASIC capab., including monitor, two disk drives, IBM printer, 20 diskettes and all manuals. Top cond., value 7K offered for $4000 or best offer. 213-372-9937, Robert Francois.

Centronics 704 180 cps bi-dir (demo), $1,495 (u-ship). Also new BASF mini-floppy drive (Shugart comp.), $150. 4116s 8/$32. SD Sales Expandoram I (used), $75 V.M. Faulkner, RR 2, Box 294A, Yorktown, IN 47396, 317-289-4138.

Two EXECuport portable terminals 10-30 cps. 80 col. printer modem. Both parallel and serial IO ports for use as printer. See ad. pg. 93, July 80 KB for details. Both units good working cond. Will ship UPS COD, no risk, pay on delivery. Model 300—$375, 320—$475. Call Warren (no coll.) at 509-534-8088, eves. Spokane, WA.

For Sale: SWTPC CT-64 terminal, 16 × 64 × 2 & features. Needs monitor. $225 or best. Also 2400-baud cassette I/O board & software, $20. William Lee, 337 E. Naples, Chula Vista, CA 92011, 714-697-3176.

Tel-It message and inventory computer system. Z-80 based terminal with 16 char. readout (no crt). Built-in tape drive, real-time clock. Will interface to printer. Cost $900, asking $500; call Bob Loveless at 714-689-7800.

For Sale: AJ 841 IO printer-terminal. IBM Selectric mech. 130 ch/line. New. Plus Apple parallel printer interface card. $750. Virginia Stern, 215 E. 11 St., NY, NY 10003. 212-477-6634.

Use the Classifieds

For Sale: All issues of Kilobaud Microcomputing. Issue #1 through December 1980. COD postage collect to best bid. Ed C. Epp, Goshen College, Goshen, IN 46526.

SWTPC 6800 for sale: 20K, serial interface, AC-30, good condition. Sell for best offer over $300. MM Computer Club, 333 75th Street, Downers Grove, IL 60516.

For Sale: TRS-80. 16K LII with numeric keypad. $550. Heath H14 printer 110-9600 baud. Adjustable pin feed. TRS-232 interface for connection to TRS-80 without expansion interface. Both for $550. Call or write Tony Greaves, 1370 Niagara Falls Boulevard, Tonawanda, NY 14150. 716-838-4957.

Wanted: used cassette software for Apple II & books on computing. Send list for my offer. Ray Gabriel, PO Box 175, Madison, OH 44057.

TRS-80 Model I 48K with exp interface keypad cassette recorder covers software Selectric printer & more. 2 disk drives, mint condition. 25-30% off. R. Clore, Jackson, MI, 517-782-4101. After 4PM 563-2978.

For Sale: Working TC-8 Hi-Speed tape system, $90. Gone Disk. Inquiries answered. G. Clark, 32 High St., Newport, ME 04953. After 6, 207-368-5295.

For Sale: New SA-400 mini-disk, $275. FD-250 quad-density drives for North Star, $325. Micromation dual-density controller, dual 8" drives, with CP/M and many extras. Excellent condition. Make offer. Working S-100 boards as follows: Serial I/O, $48; Parallel I/O, $48; Polymorphic Video, $99; Vector-Graphic ROM/RAM w/1K RAM, $48; Hardware interface S-100 to Flex-O-Writer Printer, $48; Cherry-Microswitch Keyboard w/enclosure, $48; Altair with 16-slot motherboard, heavy duty Vector power supply, custom front panel and 8080 CPU (really nice mainframe!), $299. Fred Manthey, Box 619, Mullan, ID 83846, 208-744-1328.

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of *Kilobaud Microcomputing*. Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly.

☐ Address change only
☐ Extend subscription
☐ Enter new subscription
☐ 1 year $18.00
☐ Payment enclosed (1 extra BONUS issue)
☐ Bill me later

If you have no label handy, print OLD address here.

AFFIX LABEL

Name _____ Call _____
Address _____
City _____ State _____ Zip _____

print NEW address here:

Name _____ Call _____
Address _____
City _____ State _____ Zip _____

Kilobaud **Microcomputing** P.O. Box 997 ● Farmingdale NY 11737

Dear Subscriber:

Kilobaud Microcomputing does not keep subscription records on the premises. Therefore, calling the Peterborough offices doesn't solve your subscription problem.

To quickly solve your problem, please send your most recent address label and a description of the problem to:

Kilobaud Microcomputing
Subscription Department
PO Box 997
Farmingdale, NY 11737

Please allow the subscription department at least two weeks for an answer or a solution to your problem.
Thank you and enjoy your subscription.

Sincerely,

Debra L Boud

Debra L. Boudrieau
Circulation Manager

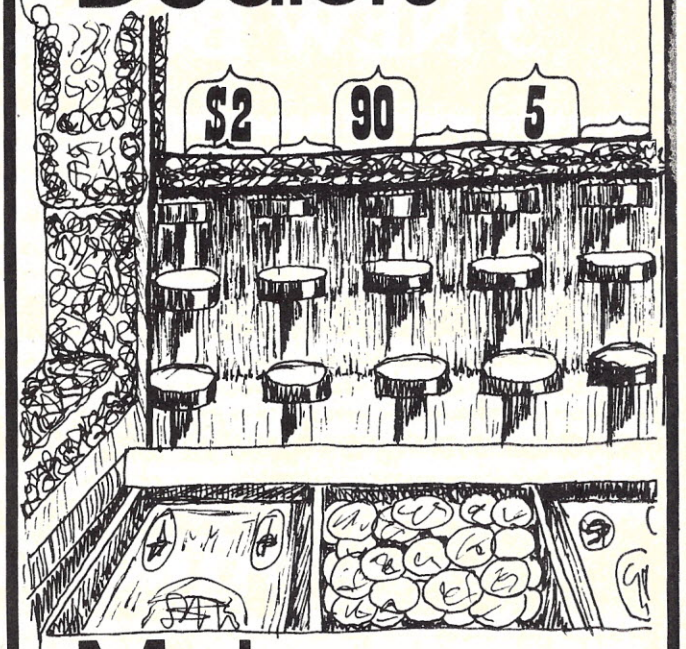
is HARD COPY STORAGE a problem?



KILOBAUD MICROCOMPUTING, as thick as it is, is more like a floppy when it comes to standing on the bookshelf. Try the **KILOBAUD MICROCOMPUTING** Library Shelf Boxes . . . sturdy corrugated white dirt-resistant cardboard boxes which will keep them from flopping around. We have self-sticking labels for the boxes, too, not only for **KILOBAUD MICROCOMPUTING,** but also for **73 Magazine, 80 MICROCOMPUTING** . . . and for **CQ, QST, Ham Radio, Personal Computing, Radio Electronics, Interface Age,** and **Byte**. Ask for whatever stickers you want with your box order. They hold a full year of **KILOBAUD MICROCOMPUTING, 80 MICROCOMPUTING** . . . or **73 Magazine**. Your magazine library is your prime reference; keep it handy and keep it neat with these strong library shelf boxes. One box (BX-1000) is $2.00, 2-7 boxes (BX-1001) are $1.50 each, and eight or more boxes (BX-1002) are $1.25 each. Be sure to specify which labels we should send. Have your credit card handy and call our toll-free order number 800-258-5473, or use the order card in the back of the magazine and mail to:

kilobaud™
MICROCOMPUTING
peterborough nh 03458

Attention Dealers



Make Money... Sell

kilobaud
MICROCOMPUTING T.M.

Selling Kilobaud MICROCOMPUTING, the most complete journal of microcomputing, brings the computer enthusiast through your door. Once he's in your store, you can sell him anything.

For information on selling Kilobaud MICROCOMPUTING, call 603-924-7296 and speak with Ginnie Boudrieau, our bulk sales manager, or write to her at Kilobaud Microcomputing, 80 Pine Street, Peterborough, NH 03458.

Our dealers are telling us that Kilobaud MICROCOMPUTING is the hottest-selling computer magazine on the newsstand, so call today and join the ranks of dealers who make money with KM.

•

kilobaud
MICROCOMPUTING T.M.
80 Pine Street, Peterborough NH 03458

kb microcomputing book nook

3 NEW BOOKS

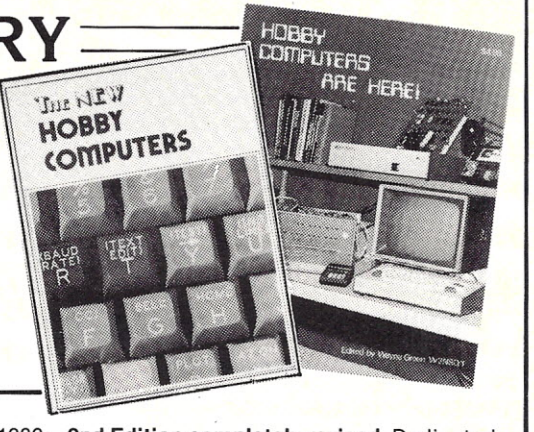


● **SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING**—BK7311—A collection of the best articles that have recently appeared in Kilobaud/MICROCOMPUTING. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardcore hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. $10.95.*

● **UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS**—BK7382—A valuable addition to your computing library. This two part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of the new microcomputing hobby. Well known authors and well structured text helps the reader get involved in America's fastest growing hobby. $10.95*

● **40 COMPUTER GAMES**—BK7381—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. $7.95*

INTRODUCTORY



● **HOBBY COMPUTERS ARE HERE!**—BK7322—If you (or a friend) want to come up to speed on how computers work . . . hardware and software . . . this is an excellent book. It starts with the fundamentals and explains the circuits, and the basics of programming. This book has the highest recommendations as a teaching aid for newcomers. $4.95.*

● **THE NEW HOBBY COMPUTERS**—BK7340—This book takes it from where "HOBBY COMPUTERS ARE HERE!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a computer, computer arithmetic, checking memory boards . . . and much, much more! Don't miss this tremendous value! Only $4.95.*

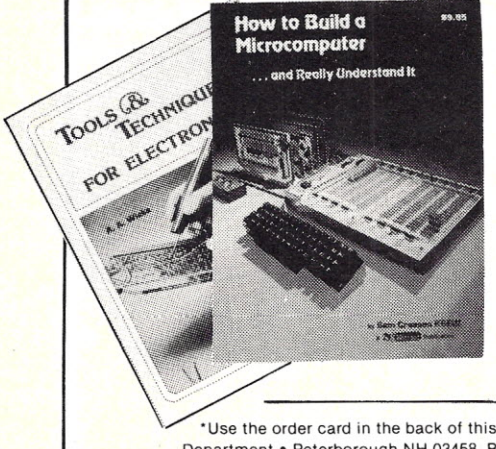
INTRODUCTION TO MICROCOMPUTERS (VOL. 0→III)

● **AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0**—BK1130—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. $7.95.*

● **VOL. I**—BK1030—**2nd Edition completely revised.** Dedicated to the basic concepts of microcomputers and hardware theory. The purpose of Volume I is to give you a thorough understanding of what microcomputers are. From basic concepts (which are covered in detail), Volume I builds the necessary components of a microcomputer system. This book highlights the difference between minicomputers and microcomputers. $12.99.*

● **VOL. II**—BK1040 (with binder)—Contains descriptions of individual microprocessors and support devices used only with the parent microprocessor. Volume II describes all available chips. $31.99*

● **VOL. III**—BK1133 (with binder)—Contains descriptions of all support devices that can be used with any microprocessor. $21.99*



● **HOW TO BUILD A MICROCOMPUTER – AND REALLY UNDERSTAND IT** – BK7325 – by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. This book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing and debugging of a complete microcomputer system. Must reading for anyone desiring a true understanding of small computer systems. $9.95.*

● **TOOLS & TECHNIQUES FOR ELECTRONICS** – BK7348 – by A. A. Wicks is an easy-to-understand book written for the beginning kit builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects as well as specialized metal working tools and the chemical aids which are used in repair shops. $4.95.*

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

SPECIAL INTERESTS



new!

● **MICROSOFT BASIC DECODED AND OTHER MYSTERIES**—BK1186—by James Farvour. From the company that brought you *TRS-80 DISK AND OTHER MYSTERIES*! Contains more than 6500 lines of comments for the disassembled Level II ROMs, six additional chapters describing every BASIC subroutine, with assembly language routines showing how to use them. Flow charts for all major routines give the reader a real insight into how the interpreter works. $29.50 (Available after December 20th).

new!

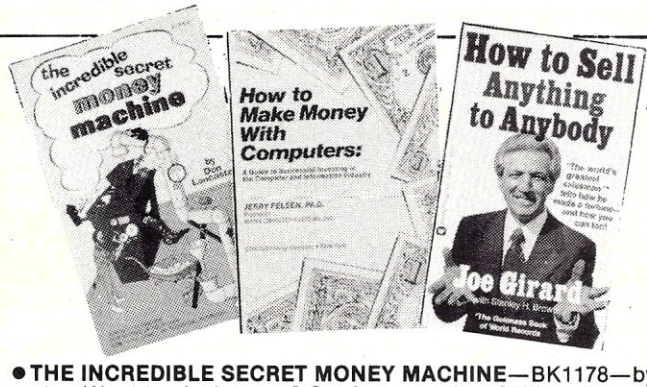
● **THE CP/M HANDBOOK (with MP/M)**—BK1187—by Rodnay Zaks. A complete guide and reference handbook for CP/M—the industry standard in operating systems. Step-by-step instruction for everything from turning on the system and inserting the diskette to correct user discipline and remedial action for problem situations. This also includes a complete discussion of all versions of CP/M up to and including 2.2, MP/M and CDOS. $13.95.

● **TRS-80 DISK AND OTHER MYSTERIES**—BK1181—by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to" information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. $22.50.*

● **INTRODUCTION TO TRS-80 GRAPHICS**—BK1180—by Don Inman. Dissatisfied with your Level I or Level II manual's coverage of graphics capabilities? This well-structured book (suitable for classroom use) is ideal for those who want to use all the graphics capabilities built into the TRS-80. A tutorial method is used with many demonstrations. It is based on the Level I, but all material is suitable for Level II use. $8.95.*

● **MICROPROCESSOR INTERFACING TECHNIQUES**—BK1037—by Austin Lesea & Rodnay Zaks—will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S100. $15.95.*

MONEYMAKING



● **HOW TO MAKE MONEY WITH COMPUTERS**—BK1003—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. $15.00.*

● **HOW TO SELL ANYTHING TO ANYBODY**—BK7306—According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune—and how you can, too. $2.25.*

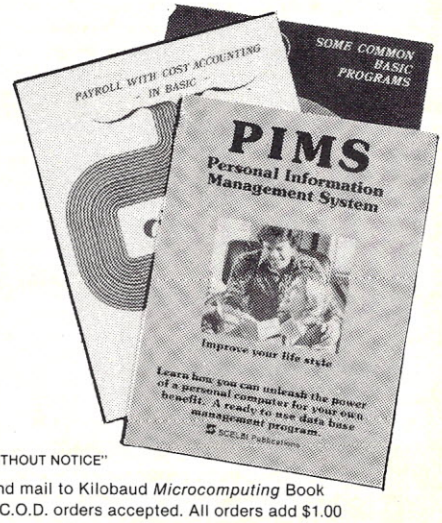
● **THE INCREDIBLE SECRET MONEY MACHINE**—BK1178—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you *like* to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. $5.95.*

BUSINESS

● **PAYROLL WITH COST ACCOUNTING—IN BASIC**—BK1001—by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in **CBASIC**). $20.00.*

● **SOME COMMON BASIC PROGRAMS**—BK1053—published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. $16.99 paperback.

● **PIMS: PERSONAL INFORMATION MANAGEMENT SYSTEM**—BK1009—Learn how to unleash the power of a personal computer for your own benefit in this ready-to-use data-base management program. $11.95.*



"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

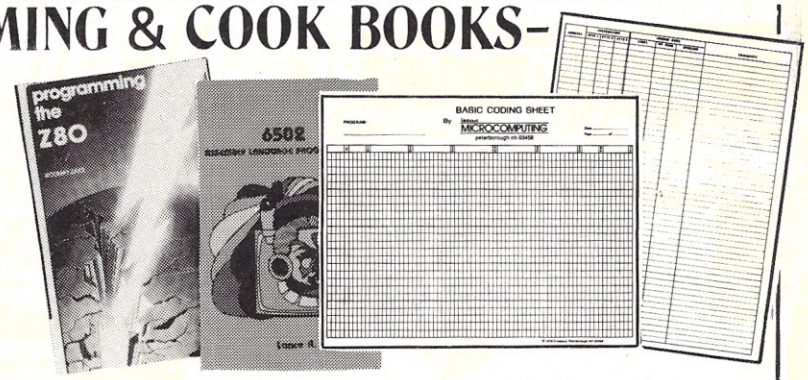
*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

–PROGRAMMING & COOK BOOKS–





–Z80–

new!

● **INSIDE LEVEL II** – BK1183 – For machine language programmers! This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. $15.95.*

● **PROGRAMMING THE Z-80** – BK1122 – by Rodnay Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text *and* a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. $14.95.*

● **Z-80 ASSEMBLY LANGUAGE PROGRAMMING** – BK1177 – by Lance A. Leventhal. This book thoroughly covers the Z80 instruction set, abounding in simple programming examples which illustrate software development concepts and actual assembly language usage. Features include Z80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. $16.99.*

● **Z-80 SOFTWARE GOURMET GUIDE AND COOKBOOK** – BK1045 – by Nat Wadsworth. Scelbi's newest cookbook! This book contains a complete description of the powerful Z-80 instruction set and a wide variety of programming information. Use the author's ingredients including routines, subroutines and short programs, choose a time-tested recipe and start cooking! $15.95.*

–6502–

● **PROGRAMMING THE 6502 (Second Edition)** – BK1005 – Rodnay Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. $12.95.*

● **6502 APPLICATIONS BOOK** – BK1006 – Rodnay Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises included. $12.95.*

● **6502 ASSEMBLY LANGUAGE PROGRAMMING** – BK1176 – by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods, and programming the 6502 interrupt system. $16.99.*

● **6502 SOFTWARE GOURMET GUIDE AND COOKBOOK** – BK1055 – by Robert Findley. This book introduces the BASIC language programmer into the realm of machine-language programming. The description of the 6502 structure and instruction set, various routines, subroutines and programs are the ingredients in this cookbook. "Recipes" are included to help you put together exactly the programs to suit your taste. $12.95.*

● ***MICROCOMPUTING* CODING SHEETS** *Microcomputing*'s dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming is Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide. 50 sheets to a pad. $2.39.*

–8080 / 8080A–

● **8080A/8085 Assembly Language Programming** – by Lance Leventhal – BK1004 – Assembly language programming for the 8080A/8085 is explained with a description of the functions of assemblers and assembly instructions, and a discussion of basic software development concepts. Many fully debugged, practical programs are included as is a special section on structured programming. $15.99.*

● **8080 PROGRAMMING FOR LOGIC DESIGN** – BK1078 – Ideal reference for an indepth understanding of the 8080 processor. Application-oriented and the 8080 is discussed in light of replacing conventional, hard-wired logic. Practical design considerations are provided for the implementation of an 8080-base control system. $9.50.*

● **8080 SOFTWARE GOURMET GUIDE AND COOKBOOK** – BK1102 – If yu have been spending too much time developing simple routines for your 8080, try this new book by Scelbi Computing and Robert Findley. Describes sorting, searching, and many other routines for the 8080 user. $12.95.*

–6800–

● **6800 PROGRAMMING FOR LOGIC DESIGN** – BK1077 – Oriented toward the industrial user, this book describes the process by which conventional logic can be replaced by a 6800 microprocessor. Provides practical information that allows an experimenter to design a complete micro control system from the "ground up." $9.50.*

● **6800 SOFTWARE GOURMET GUIDE AND COOKBOOK** – BK1075 – Like its culinary cousin, *The 8080 Gourmet Guide*, this book by Scelbi Computing and Robert Findley describes sorting, searching and other routines – this time for the 6800 user. $12.95.*

–COOK BOOKS–

● **CMOS COOKBOOK** – BK1011 – by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! $10.50.*

● **TVT COOKBOOK** – BK1064 – by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. $9.95.*

● **TTL COOKBOOK** – BK1063 – by Donald Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. $9.50.*

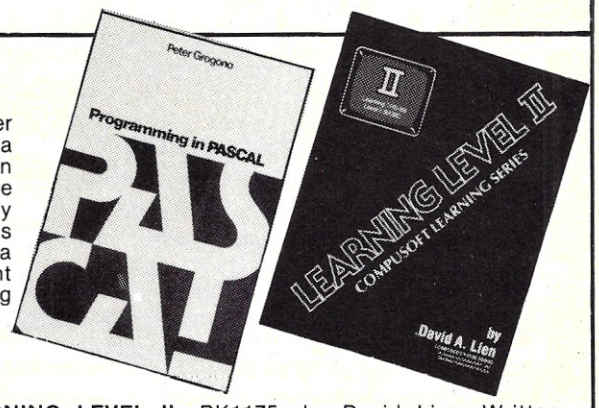
"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.00 handling. Please allow 4–6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

BASIC AND PASCAL



NEW REVISED EDITION

● **PROGRAMMING IN PASCAL**—BK1140—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language; it is therefore suitable for an introductory course. $12.95.*

● **THE BASIC HANDBOOK**—BK1174—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. $14.95.*

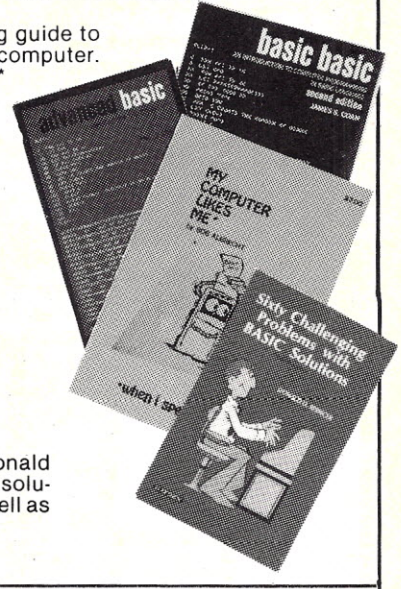
● **LEARNING LEVEL II**—BK1175—by David Lien. Written especially for the TRS-80, this book concentrates on Level II BASIC, exploring every important BASIC language capability. Updates are included for those who have studied the Level I User's Manual. Sections include: how to use the Editor, dual cassette operation, printers and peripheral devices, and the conversion of Level I programs to Level II. $15.95.*



● **BASIC NEW 2ND EDITION**—BK1081—by Bob Albrecht. Self-teaching guide to the computer language you will need to know for use with your microcomputer. This is one of the easiest ways to learn computer programming. $6.95.*

● **BASIC BASIC (2ND EDITION)**—BK1026—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. $9.45.*

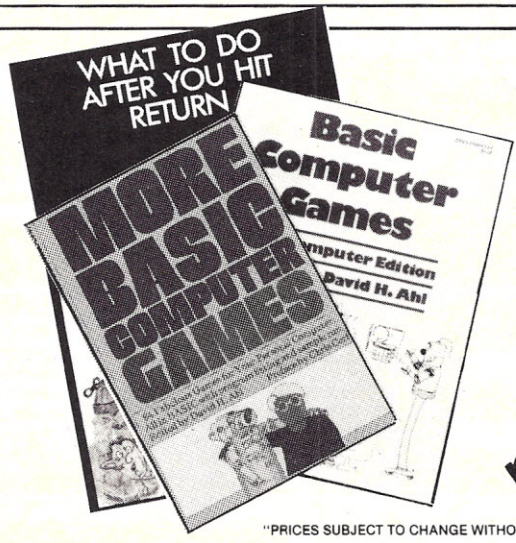
● **ADVANCED BASIC**—BK1000—Applications, including strings and files, coordinate geometry, area, sequences and series, simulation, graphing and games. $9.65*.



● **MY COMPUTER LIKES ME . . . WHEN I SPEAK BASIC**—BK1039—An introduction to BASIC . . . simple enough for kids. If you want to teach BASIC to anyone quickly, this is the way to go. $3.95.*

● **SIXTY CHALLENGING PROBLEMS WITH BASIC SOLUTIONS (2nd Edition)**—BK1073—by Donald Spencer, provides the serious student of BASIC programming with interesting problems and solutions. No knowledge of math above algebra required. Includes a number of game programs, as well as programs for financial interest, conversions and numeric manipulations. $6.95.*

GAMES



● **WHAT TO DO AFTER YOU HIT RETURN**—BK1071—PCC's first book of computer games . . . 48 different computer games you can play in BASIC . . . programs, descriptions, many illustrations. Lunar Landing, Hammurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. $10.95.*

● **BASIC COMPUTER GAMES**—BK1074—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. $7.50.*

new!

● **MORE BASIC COMPUTER GAMES**—BK1182—edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you *BASIC Computer Games.* Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. $7.50.*

"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

Power Supplies! Power Supplies! Power Supplies! SOLID STATE!! (5)

We got 'em! Take your pick . . .

These units are ideal for micro computers. They have been removed from equipment, checked out and guaranteed.

1—5 volts @ 8 amps + 12 volts @ 2 amps + 6 volts @ 75 MA. Power supply has a 3-wire line cord and fused. Dimensions: 10½" x 5½" x 4½". Shipping weight: 16 lbs. ..... 37.50 ea. 2/70.00

2—Model 818, 5 volts at 15 amps + 12 volts at 4 amps-12 volts at 2 amps. (with line cord). ..... 35.00 ea. 2/65.00

3— + 5 volts at 5 amps ± 12 volts at 500 ma. + 6 volts at 25 ms. (line cord included). ..... 32.95 ea. 2/60.00

4—Elexon, multi output. Input: 120/240 AC, ±10%, 47-63 hz; output: 1) 12V, 1.5A, DC, OVP; 2) 12V, 1.5A, D.C., OVP. New, in box with operating instructions. 31.50

5—Power Design, Model 1210, constant voltage, DC. P.S. input: 105-125 A.C., 55 to 440 hz. Output: 1-12 volts, 0-10 amps, DC. continuously adjustable output voltage 139.00

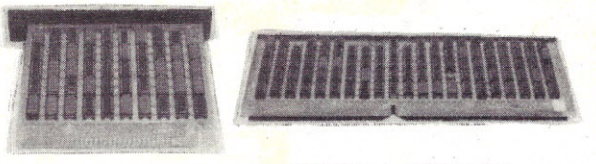
COMPUTER GRADE CAPACITORS . . .

18,000 mfd 10 VDC	1.25	11,000 mfd 25 VDC	1.50	4,000 mfd 75 VDC	1.75
4,400 mfd 20 VDC	1.00	35,000 mfd 35 VDC	3.50	500 mfd 100 VDC	1.00
46,000 mfd 20 VDC	2.50	10,000 mfd 50 VDC	2.50	6 80 mfd 100 VDC	3.50
3.000 mfd 25 VDC	1.00	88,000 mfd 75 VDC	3.75	330 mfd 150 VDC	175

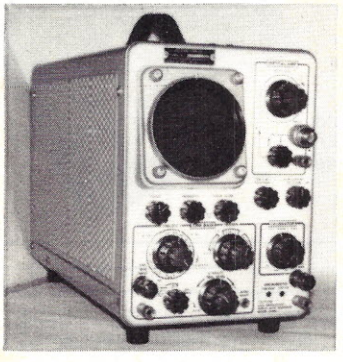
WIRE WRAP BOARDS

These boards are pre-wired and removed from equipment. Easy to unwrap for setting up your own board, contains mostly 14-pin IC sockets with individual pin connections. Each board has VCC and ground planes.

Smaller board measures 6½" x 6" and has 40 to 50 sockets.
Larger board measures 13½" x 6" and has 75 to 100 sockets.



Reduced prices **$7.50 ea. 2/$14.00**
$12.50 ea. 2/$23.00



freq: dc to 4mhz
sweep range: 0.1us to 0.6s/div.
versatile triggering, internal, external, line, AC or DC coupled & automatic triggering

*TEKTRONIX 310**
PORTABLE SCOPE

*(HICKOK equivalent)

SALE PRICE $249.00

add 10% shipping

TRIAD CONTROL TRANSFORMERS

input: 115/230vac 50/60hz lug type connections

MODEL F107Z
Secondary: 12V at 8A/24V at 2A
Output: 48VA **$5.75 ea.**
add 10% shipping

MODEL F108/U
Secondary: 12V at8A/24V at 4A
Output: 96VA **$8.00 ea.**
add 10% shipping

MODEL F109/V
Secondary: 12V at 16A/24V at 8A
Output: 192VA **$17.50 ea.**
add 10% shipping

TRANSFORMERS

ISOLATION STEP-DOWN TYPE

Primary: 230/115V, 50/60 CPS, Secondary: 115 volts output 250 VA. **$13.95**
add 10% shipping

ROTRON WHISPER FANS

Unused, Model Rotron MU 3A1, 230V, AC, 14 watts, 50/60 hz, guaranteed, 4½" x 4½" x 1½" **$8.95**

Clock Crystal Oscillators—TTL, Vectron, type CO-231T. Crystal freq. 4.9152 mhz. Input voltage 5 VDC ±. Output: Drives 10 TTL Loads Logic "0": 0.4V max., sink 16ma. Logic "1" 2.4V min source 2 ma. (above 50 mhz drives 2 Schottky TTL loads). Tuning adjust. with nominal range of ±30 ppm below 25 mhz and 15 ppm above 25 mhz. R.F.E. 1½" x 1½" x ½" $13.95

Minimum order $25.00. Items offered subject to prior sale. FOB, Brockton, Mass. Money order or check w/order. Shipments and handling add 5%. Shipments by parcel post or UPS. No CODs. Mass. residents add 5% sales tax.

WALLEN ELECTRONICS CO. INC. Tel: (617) 588-6440-6441
108 SAWTELL AVE., BROCKTON, MA. 02402

ELECTRONIC COMPONENTS
TEST EQUIPMENT
CONNECTORS—WIRE

WAMECO

THE COMPLETE PC BOARD HOUSE
EVERYTHING FOR THE S-100 BUSS

NEW

MEM-3, 32K STATIC RAM BOARD

* 32K of 2114's
* Full 24 line address decoding. (Or bank select like the MEM-2)
* Expandable in 1K increments. (Board disabled for unloaded RAM)
* Bi-directional capability on data lines. (Board may be used as upper or lower 8 bits on a 16 bit bi-directional buss.)
* Addressable in 8K boundary within the 64K boundary selected.
* Kits less RAM . . . . . $112.95.
  With 2114L-4 . . . . . $475.95.
  With 2114L-2 . . . . . $549.95.
  Bare board . . . . . $ 35.95.
  Available mid January.

FUTURE PRODUCTS: 80 CHARACTER VIDEO BOARD.
Z-80 CPU BOARD WITH ROM, 8 PARALLEL PORT I/O BOARD.

DEALER INQUIRIES INVITED, UNIVERSITY DISCOUNTS AVAILABLE AT YOUR LOCAL DEALER

MOST PRODUCTS FOR IMMEDIATE SHIPMENT. NO 4-8 WEEK DELAYS REQUIRED FOR OTHERS.

wmc inc.

WAMECO, INC., P. O. BOX 877 • 455 PLAZA ALHAMBRA • EL GRANADA, CA 94018 • (415) 726-6378

CALIFORNIA COMPUTER SYSTEMS

32K RAM BOARD A&T.
450 NSEC .....$579.95, 200 NSEC $629.95
16K RAM A&T.
450 NSEC .....$255.95, 200 NSEC $285.95
64K DYNAMIC A&T.
200 NSEC $579.95
Z80 PROCESSOR A&T. $259.00
DISC CONTROLLER $339.95
APPLE IEEE INSTRUMENTATION INTERFACE KIT 7490. Kit $275.00
ARITHMETIC PROCESSOR FOR APPLE 7811A. Kit $325.95
APPLE ASYNCHRONOUS SERIAL INTERFACE 7710A. Kit $89.95
APPLE SYNCHRONOUS SERIAL INTERFACE 7712A. Kit $89.95
ALL OTHER CCS PRODUCTS AVAILABLE

SSM

PB-1 2708 & 2716 Programming Board with provisions for 4K or 8K EPROM. No external supplies required. Textool sockets. Kit..... $143.00
CB-1A 8080 Processor Board. 2K of PROM 256 BYTE RAM power on/rest Vector Jump Parallel port with status. Kit ....$146.00 PCBD $31.95
VB-3 80x24 VIDEO BOARD. Graphics included. 4MHZ $379.95
IO-4 Two serial I/O ports with full handshaking 20/60 ma current loop: Two parallel I/O ports. Kit .....$168.00 PCBD $31.95
VB-IC 64 x 16 video board, upper lower case Greek composite and parallel video with software, S-100. Kit $143.00
CB-2 Z80 CPU BOARD. Kit $199.95
AIO APPLE SERIAL/PARALLEL $144.95
ALL OTHER SSM PRODUCTS AVAILABLE

---

wmc inc. **WAMECO INC.**

MEM-3 32K STATIC RAM 2114 24 bit addressing $32.95
FDC-1 FLOPPY CONTROLLER BOARD will drive shugart, pertek, remic 5" & 8" drives up to 8 drives, on board PROM with power boot up, will operate with CPM™ (not included). PCBD $43.95
FPB-1 Front Panel. IMSAI size, hex displays. Byte, or instruction single step. PCBD $48.50
QM-12 MOTHER BOARD, 13 slot, terminated, S-100 board only $39.95
CPU-1 8080A Processor board S-100 with 8 level vector interrupt. PCBD $28.95
RTC-1 Realtime clock board. Two independent interrupts. Software programmable. PCBD.....$25.95
EPM-2 2708/2716 16K/32K EPROM CARD. PCBD $28.95
QM-9 MOTHER BOARD. Short Version of QM-12. 9 Slots. PCBD $33.95
MEM-2 16K x 8 Fully Buffered 2114 Board. PCBD $28.95
PTB-1 POWER SUPPLY AND TERMINATOR BOARD. PCBD $28.95
IOB-1 SERIAL AND PARALLEL INTERFACE. 2 parallel, one serial and cassette. PCBD $28.95

2708..... $7.50 2114L 450 NSEC $4.99
2716.....$25.95 2114L 200 NSEC $5.99

MIKOS

(415) 726-7593
P. O. Box 955 • El Granada, CA 94018
Please send for IC, Xistor and Computer parts list

JAN. SPECIAL SALE ON PREPAID ORDERS
(Charge cards not included on this offer)

WAMECO PCBD SALE.
MEM-2 EPM-2 .....$25.95
IOB-1, CPU-1 .....$24.95
PTB-1, RTC-1 .....$22.95
QMB-12 .....$32.95 QMB-9 .....$29.95

MIKOS PARTS ASSORTMENT WITH WAMECO AND CYBERCOM PCBDS

MEM-2 with MIKOS #7 16K ram with L2114 450 NSEC $229.95
MEM-2 with MIKOS #13 16K ram with L2114 200 NSEC $249.95
CPU-1 with MIKOS #2 8080A CPU $99.95
QM-12 with MIKOS #4 13 slot mother board $110.95
RTC-1 with MIKOS #5 real time clock.....$65.95
EMP-1 with MIKOS #10 4K 1702 less EPROMS .....$ 49.95
EPM-2 with MIKOS #11 16-32K EPROMS less EPROMS $65.95
QM-9 with MIKOS #12 9 slot mother board $99.95
FPB-1 with MIKOS #14 all parts for front panel $144.95

MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED. ALL SOCKETS INCLUDED.

LARGE SELECTION OF LS TTL AVAILABLE
PURCHASE $50.00 WORTH OF LS TTL AND GET 10% CREDIT TOWARD ADDITIONAL PURCHASES.
PREPAID ORDERS ONLY.

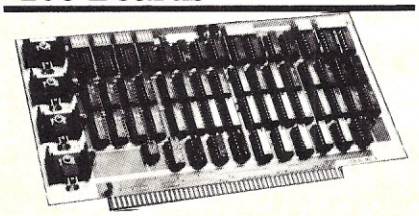
VISA or MASTERCHARGE. Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. **$10 minimum order. $1.50 service charge on orders less than $10.00.**

Reader Service—see page 226

WE'RE GIV

We're not selling it. The JADE Catalog is the best, and the best things in life are free. We will send you our new 1981 edition describing over 4000 microcomputer parts, components, boards, systems, accessories,

S-100 Boards



64K RAM Board - Cal Comp Sys
4 MHz, bank selectable, IEEE standard
MEM-64565A *A & T* **$449.95**

Memory Bank - Jade
4 MHz, IEEE S-100, bank selectable, 8 or 16 bit
MEM-99730K *Kit, no RAM* **$219.95**
MEM-16730K *16K kit* **$249.95**
MEM-16730A *16K A & T* **$299.95**
MEM-32731K *32K kit* **$289.95**
MEM-32731A *32K A & T* **$339.95**
MEM-48732K *48K kit* **$324.95**
MEM-48732A *48K A & T* **$374.95**
MEM-64733K *64K kit* **$359.95**
MEM-64733A *64K A & T* **$409.95**
MEM-99730B *Bare board* **$55.00**

ExpandoRAM II - SD Systems
4 MHz RAM board expandable from 16K to 256K
MEM-16630A *16K kit* **$289.95**
MEM-16630A *16K Jade A & T* **$339.95**
MEM-32631K *32K kit* **$329.95**
MEM-32631A *32K Jade A & T* **$379.95**
MEM-48632K *48K kit* **$369.95**
MEM-48631A *48K Jade A & T* **$419.95**
MEM-64633K *64K kit* **$409.95**
MEM-64633A *64K Jade A & T* **$459.95**

32K STATIC RAM - Jade
2 or 4 MHz expandable static RAM board uses 2114L's
MEM-16151K *16K 4 MHz kit* **$169.95**
MEM-16151A *16K 4 MHz A & T* ... **$224.95**
MEM-32151K *32K 4 MHz kit* **$299.95**
MEM-32151A *32K 4 MHz A & T* ... **$349.95**

16K STATIC RAM - Cal Comp Sys
2 or 4 MHz 16K static RAM - a real memory bargain
MEM-16160A *16K 2 MHz A & T* ... **$279.00**
MEM-16162A *16K 4 MHz A & T* ... **$309.00**
MEM-16160B *Bare board* **$29.95**

THE BIG Z* - Jade
2 or 4 MHz switchable Z-80 CPU with serial I/O*
CPU-30201K *Kit* **$145.00**
CPU-30201A *A & T* **$199.00**
CPC-30200B *Bare board* **$35.00**

SBC-100 - SD Systems
2.5 MHz Z-80 CPU with serial & parallel I/O ports*
CPC-30100K *Kit* **$299.95**
CPC-30100A *Jade A & T* **$369.95**

SBC-200 - SD Systems
4 MHz Z-80 CPU with serial & parallel I/O ports*
CPC-30200K *Kit* **$339.95**
CPC-30200A *Jade A & T* **$499.95**

CB2 - S.S.M.
2 or 4 MHz switchable Z-80 CPU with RAM, ROM, & I/O*
CPU-30300K *Kit* **$239.95**
CPC-30300A *A & T* **$299.95**

2810 Z-80* CPU - Cal Comp Sys
2/4 MHz Z-80A CPU w/serial I/O port*
CPU-30400A *A & T* **$275.00**

DOUBLE-D - Jade
Double density controller with the inside track
IOD-1200K *Kit* **$299.95**
IOD-1200A *8" A & T* **$389.95**
IOD-1205A *5¼" A & T* **$389.95**
IOD-1200B *Bare board* **$65.00**

DOUBLE DENSITY - Cal Comp Sys
5¼" or 8" disk controller with free CP/M 2.2
IOD-1300A *A & T* **$374.95**

VERSAFLOPPY II - SD Systems
New double density controller for both 8" & 5¼"
IOD-1160K *Kit* **$379.95**
IOD-1160A *Jade A & T* **$439.95**

S.P.I.C. - Jade
Our new I/O card with 2 SIO's, 4 CTC's, and 1 PIO
IOI-1045K *2 CTC's, 1 SIO, 1 PIO* .. **$199.00**
IOI-1045A *A & T* **$259.00**
IOI-1046K *4 CTC's, 2 SIO's, 1 PIO* **$259.00**
IOI-1046A *A & T* **$319.00**
IOI-1045B *Bare board w/ manual* ... **$59.95**
IOI-1045D *Manual only* **$20.00**

I/O-4 - S.S.M.
2 serial I/O ports plus 2 parallel I/O ports
IOI-1010K *Kit* **$179.95**
IOI-1010A *A & T* **$259.95**
IOI-1010B *Bare board* **$35.00**

100K DAY CLOCK - Mtn Hardware
Crystal controlled S-100 clock with NiCad backup
IOK-1400A *A & T* **$329.95**

SB1 - S.S.M.
15 Hz to 25K Hz music synthesizer for S-100
IOS-1005K *Kit* **$239.95**
IOS-1005A *A & T* **$299.95**

TB-4 - Mullen
Extremely versatile extender board with logic probe
TSX-180K *Kit* **$55.00**
TSX-180A *A & T* **$75.00**

S-100 EXTENDER - Cal Comp Sys
Puts problem boards within easy reach
TSX-160A *A & T* **$24.95**

VIDEO BOARD - Jade
64 x 16 assembled & tested S-100 video board
IOV-1050B *Bare board* **$25.00**
IOV-1050K *Kit* **$99.95**
IOV-1050A *A & T sale price* **$139.95**

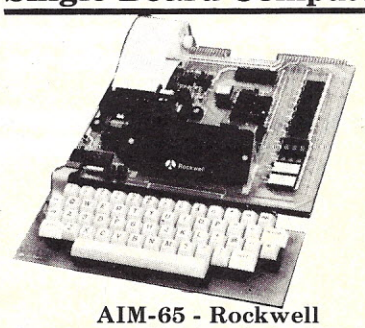
VDB-8024 - SD Systems
80 x 24 I/O mapped video board with keyboard I/O
IOV-1020K *Kit* **$399.95**
IOV-1020A *Jade A & T* **$459.95**

VB3 - S.S.M.
80 x 24 or 80 x 48 memory mapped with graphics
IOV-1095K *Kit, 4 MHz* **$399.95**
IOV-1095A *A & T, 4 MHz* **$464.95**
IOV-1096K *80 x 48 upgrade, 4 MHz* . **$89.00**

PB-1 - S.S.M.
2708, 2716 EPROM board with built-in programmer
MEM-99510K *Kit* **$159.95**
MEM-99510A *A & T* **$239.95**

PROM-100 - SD Systems
2708, 2716, 2732, 2758, & 2516 EPROM programmer
MEM-99520K *Kit* **$219.95**
MEM-99520A *Jade A & T* **$269.95**

Single Board Computers



AIM-65 - Rockwell
6502 computer with printer, display, & keyboard
CPK-50165 *1K AIM* **$374.95**
CPK-50465 *4K AIM* **$449.95**
SFK-74600008E *8K BASIC ROM* ... **$99.95**
SFK-64600004E *4K assembler ROM* **$84.95**
PSX-030A *Power supply* **$64.95**
ENX-000002 *Enclosure* **$49.95**
4K AIM, 8K BASIC, power supply, & enclosure
Special package price **$625.00**

Z-80* STARTER KIT - SD Systems
Z-80 computer with RAM, ROM, I/O, & keyboard*
CPS-30010K *Kit* **$369.95**
CPS-30010A *Jade A & T* **$459.95**

Motherboards

ISO-BUS - Jade
Silent, simple, and on sale - a better motherboard
6 Slot (5¼" x 8⅝")
MBS-061B *Bare board* **$19.95**
MBS-061K *Kit* **$39.95**
MBS-061A *A & T* **$49.95**
12 Slot (9¾" x 8⅝")
MBS-121B *Bare board* **$29.95**
MBS-121K *Kit* **$69.95**
MBS-121A *A & T* **$89.95**
18 Slot (14½" x 8⅝")
MBS-181B *Bare board* **$49.95**
MBS-181K *Kit* **$99.95**
MBS-181A *A & T* **$139.95**

Mainframes

MAINFRAME - Cal Comp Sys
12 slot S-100 mainframe with 20 amp power supply
ENC-112105 *Kit* **$309.95**
ENC-112106 *A & T* **$349.95**

DISK MAINFRAME - NNC
Dual 8" drive cutouts with 8 slot motherboard
ENS-112320 *with 30 amp p.s.* **$699.95**

Video Monitors

9" B & W MONITOR - A.P.F.
High quality, high resolution video monitor
VDM-750900 *9" monitor* **$149.95**

13" COLOR MONITOR - Zenith
The hi res color you've been promising yourself
VDC-201301 ..... **$449.00**

12" GREEN SCREEN - NEC
20 MHz, P31 phosphor video monitor with audio
VDM-651200 *12" monitor* **$249.95**

SUP'R'MOD II - M & R Assoc
Color or B & W TV interface recommended for Apple
IOR-5050A *A & T* **$29.95**

ING IT AWAY

peripherals, and software. **All you have to do is ask for it.** Just circle our inquiry number on the reader service card in the rear of this magazine and we will send you the best. **It's free and it's easy.**

Accessories for Apple



16K MEMORY UPGRADE
Add 16K of RAM to your TRS-80, Apple, or Exidy

MEX-16100K *TRS-80 kit* **$39.95**
MEX-16101K *Apple kit* **$39.95**
MEX-16102K *Exidy kit* **$39.95**

DISK DRIVE for APPLE
5¼" disk drive with controller for your Apple

MSM-12310C *with controller* **$475.00**
MSM-123101 *w/out controller* **$375.00**

8" DRIVES for APPLE
Controller, DOS, two 8" drives, cabinet, & cable

Special package price **$1475.00**

AIO - S.S.M.
Parallel & serial interface for your Apple

IOI-2050K *Kit* **$159.00**
IOI-2050A *A & T* **$199.00**

PRINTER INTERFACE - Cal Comp Sys
Centronics type I/O card w/ firmware

IOI-2041A *A & T* **$99.95**

APPLE CLOCK - Cal Comp Sys
Real time clock w/battery back-up

IOK-2100A *A & T* **$119.95**

SUPERTALKER - Mtn Hardware
Speech recognition/synthesizer w/speaker & mike

IOS-2015A *A & T* **$275.00**

Z-80* CARD for APPLE
Z-80 CPU card with CP/M for your Apple*

CPX-30800A *A & T* **$279.95**

MICROMODEM - D.C. Hayes
Auto answer/dial modem card for Apple or S-100

IOM-2010A *Apple modem* **$349.95**
IOM-1100A *S-100 modem* **$375.00**

Micronet Modem - Micromate
Direct connect w/ all Micromodem II features

IOM-2020A *Best Apple modem* **$275.00**



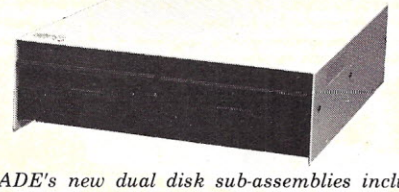
EPROM ERASERS
Spectronics hi intensity industrial eraser

XME-3100 *Without timer* **$69.95**
XME-3101 *With timer* **$94.50**

L.S. Engineering UV eraser for up to 48 EPROMs

XME-3200 *A & T* **$39.95**

8" Disk Drive Sale



JADE's new dual disk sub-assemblies include: Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, cooling fan, cable kit, lighted power switch, approved fuse assembly, line cord, Never-Mar rubber feet, and all necessary hardware to mount 2-8" disk drives - it's all American made, guaranteed for six monthes, and it's in stock!

Dual 8" Sub-Assembly Cabinet

END-000421 *Cabinet kit* **$225.00**
END-000420 *Bare cabinet* **$59.95**

Single sided, double density disk drive sub-system

END-000423 *Kit w/2 8" drives* **$995.00**
END-000424 *A & T w/2 8" drives* **$1195.00**

Double sided, double density disk drive sub-system

END-000426 *kit w/2 8" drives* **$1495.00**
END-000427 *A & T w/2 8" drives* **$1695.00**

8" DISK DRIVES
Highly reliable double density floppy disk drives

Shugart 801R single sided, double density

MSF-10801R *SA-801R* **$425.00**
Special Sale Price ..... ***2 for $790.00***

Siemens FDD100-8D2 single sided, double density

MSF-201120 *6 mo warranty* **$395.00**
Special sale price ..... ***2 for $750.00***

Qume Datatrak 8 double sided, double density

MSF-750080 *SA-851R compatible* .. **$625.00**
Special sale price ..... ***2 for $1198.00***

JADE DISK PACKAGE
Double-D controller kit, two 8" double density drives CP/M 2.2, cabinet, power supply, & cables

Special package price **$1395.00**

DISKETTES - Jade
Bargain prices on magnificent magnetic media

5¼" single sided, single density, box of 10

MMD-5110103 *Soft sector* **$27.95**
MMD-5111003 *10 sector* **$27.95**
MMD-5111603 *16 sector* **$27.95**

5¼" double sided, double density, box of 10

MMD-5220103 *Soft sector* **$39.95**

8" single sided, single density, box of 10

MMD-8110103 *Soft sector* **$33.95**

8" single sided, double density, box of 10

MMD-8120103 *Soft sector* **$39.95**

8" double sided, double density, box of 10

MMD-8220103 *Soft sector* **$57.95**

NOVATION CAT
300 baud, auto answer/originate acoustic modem

IOM-5200A *Special sale price* **$139.00**

D-CAT 300 baud, direct connect modem

IOM-5201A *Special sale price* **$179.00**

***Z-80, Z-80A, and the letter Z are recognized trademarks of Zilog, Inc. *CP/M is a registered trademark of Digital Research Corp. *CBASIC is a trademark of Compiler Systems, Inc.**

Printers



SPINWRITER - NEC
65 cps, bi-directional, letter quality with tractor

PRD-55510 *with 16K buffer* **$2595.00**

BASE 2 - Impact Printer
132 cps, bi-directional, tractor feed, & graphics

PRM-13100 ..... **$649.00**

DP-9501 - Anadex
9 x 11 dot matrix, 220 column, 200 cps, & graphics

PRM-10501 *Standard DP-9501* **$1395.00**
PRM-10511 *with graphics & 2K* .. **$1450.00**

MICROPROCESSORS

Z-80	10.95
Z-80A	12.95
6502	11.50
6800	11.95
6802	17.95
6809	39.95
8035	24.00
8080A	6.59
8085	15.95
8748	59.95

Z-80 SUPPORT

3881 *PIO*	9.50
3881-4 *PIO-4 MHz*	14.50
3882 *CTC*	9.50
3882-4 *CTC-4 MHz*	14.95
3883 *SIO*	29.50
3884 *SIO*	49.50

6800 SUPPORT

6821P	5.95
6828P	11.95
6834P	22.50
6840P	18.75
6850P	4.80
6852P	5.79
6875L	7.40
68488P	25.00

BAUD RATE GENERATORS

MC14411	10.00
1.843 MHz xtal	4.95

UARTS

AY5-1013A	5.25
AY3-1014A	8.25
TR1602B	5.25
TMS6011	5.95
IM6402	9.00

PROMS

2708 *450ns*	8.25
10 for $59.00	
2716 *12,5v*	12.95
2716 *5v*	12.95
10 for $99.00	
2532 *5v*	39.95
2732 *5v*	39.95
2758 *5v*	19.95

RAMS

21L02 *2 MHz*	1.25
21L02A *4 MHz*	1.50
2114L *2 MHz*	3.75
2114LA *4 MHz*	3.95
2147 *70ns*	39.95
4116	4.95
4164 *64K x1*	175.00
5257 *2 MHz*	6.75
5257A *4 MHz*	7.25
MK4118	18.95

SUPPORT DEVICES

8212	4.95
8214	4.65
8216	2.95
8224	3.25
8224-4	10.95
8226	3.85
8228	4.95
8238	4.95
8243	8.00
8250	14.95
8251	6.50
8253	13.95
8255	6.50
8257	19.95
8259	17.95
8275	49.95
8279	15.95

PLACE ORDERS TOLL FREE

Continental U.S. **800-421-5500**
Inside California **800-262-1710**

For Technical Inquiries or Customer Service call
213-973-7707

JADE
✓48 ***Computer Products***

4901 W. Rosecrans, Hawthorne, Ca 90250

TERMS OF SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. Minimum order $15.00. California residents add 6% tax. Minimum shipping and handling charge $2.50 **Pricing and availability subject to change without notice.**

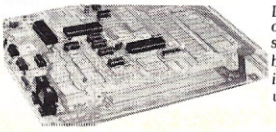
Start learning and computing for only ***$129.95*** *with a Netronics 8085-based computer kit. Then expand it in low-cost steps to a business/development system with 64k or more RAM, 8" floppy disk drives, hard disks and multi-terminal I/O.*

THE NEW EXPLORER/85 SYSTEM

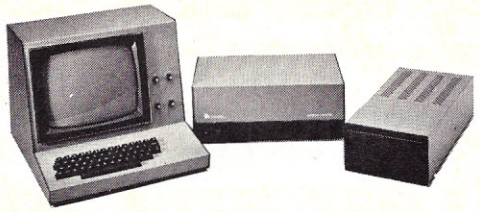
Special! *Full 8" floppy, 64k system for less than the price of a mini! Only* **$1499.95!**

(Also available wired & tested, $1799.95)

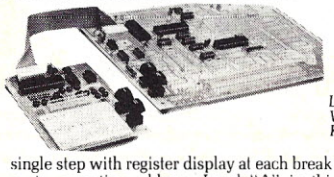
Imagine — for only $129.95 you can own the starting level of Explorer/85, a computer that's expandable into full business/development capabilities — a computer that can be your beginner system, an OEM controller, or an IBM-formatted 8" disk small business system. From the first day you own Explorer/85, you begin computing on a significant level, and applying principles discussed in leading computer magazines. Explorer/85 features the advanced Intel 8085 cpu, which is 100% compatible with the older 8080A. It offers onboard S-100 bus expansion, Microsoft BASIC in ROM, plus instant conversion to mass storage disk memory with standard IBM-formatted 8" disks. All for only $129.95, plus the cost of power supply, keyboard/terminal and RF modulator if you don't have them (see our remarkable prices below for these and other accessories). With a Hex Keypad/display front panel, Level "A" can be programmed with no need for a terminal, ideal for a controller, OEM, or a real low-cost start.



Level "A" is a complete operating system, perfect for beginners, hobbyists, industrial controller use. $129.95



Full 8" disk system for less than the price of a mini (shown with Netronics Explorer/85 computer and new terminal). System features floppy drive from Control Data Corp., world's largest maker of memory storage systems (not a hobby brand!)



Level "A" With Hex Keypad/Display.

LEVEL "A" SPECIFICATIONS

Explorer/85's Level "A" system features the advanced Intel 8085 cpu, an 8355 ROM with 2k deluxe monitor/operating system, and an advanced 8155 RAM I/O . . . all on a single motherboard with room for RAM/ROM/PROM/EPROM and S-100 expansion, plus generous prototyping space.

PC Board: Glass epoxy, plated through holes with solder mask. • **I/O:** Provisions for 25-pin (DB25) connector for terminal serial I/O, which can also support a paper tape reader . . . cassette tape recorder input and output . . . cassette tape control output . . . LED output indicator on SOD (serial output) line . . . printer interface (less drivers) . . . total of four 8-bit plus one 6-bit I/O ports. • **Crystal Frequency:** 6.144 MHz. • **Control Switches:** Reset and user (RST 7.5) interrupt . . . additional provisions for RST 5.5, 6.5 and TRAP interrupts onboard. • **Counter/Timer:** Programmable, 14-bit binary. • **System RAM:** 256 bytes located at F800, ideal for smaller systems and for use as an isolated stack area in expanded systems . . . RAM expandable to 64K via S-100 bus or 4k on motherboard.

System Monitor (Terminal Version): 2k bytes of deluxe system monitor ROM located at F800, leaving 0000 free for user RAM/ROM. Features include tape load with labeling . . . examine/change contents of memory . . . insert data . . . warm start . . . examine and change all registers . . . single step with register display at each break point, a debugging/training feature . . . go to execution address . . . move blocks of memory from one location to another . . . fill blocks of memory with a constant . . . display blocks of memory . . . automatic baud rate selection to 9600 baud . . . variable display line length control (1-255 characters/line) . . . channelized I/O monitor routine with 8-bit parallel output for high-speed printer . . . serial console in and console out channel so that monitor can communicate with I/O ports.

System Monitor (Hex Keypad/Display Version): Tape load with labeling . . . tape dump with labeling . . . examine/change contents of memory . . . insert data . . . warm start . . . examine and change all registers . . . single step with register display at each break point . . . go to execution address. Level "A" in this version makes a perfect controller for industrial applications, and is programmed using the Netronics Hex Keypad/Display. It is low cost, perfect for beginners.

HEX KEYPAD/DISPLAY SPECIFICATIONS

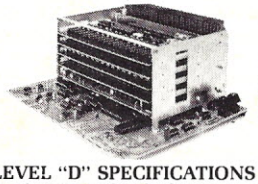
Calculator type keypad with 24 system-defined and 16 user-defined keys. Six digit calculator-type display, that displays full address plus data as well as register and status information.

LEVEL "B" SPECIFICATIONS

Level "B" provides the S-100 signals plus buffers/drivers to support up to six S-100 bus boards, and includes: address decoding for onboard 4k RAM expansion selectable in 4k blocks . . . address decoding for onboard 8k EPROM expansion selectable in 8k blocks . . . address and data bus drivers for onboard expansion . . . wait state generator (jumper selectable), to allow the use of slower memories . . . two separate 5 volt regulators.

LEVEL "C" SPECIFICATIONS

Level "C" expands Explorer/85's motherboard with a card cage, allowing you to plug up to six S-100 cards directly into the motherboard. Both cage and card are neatly contained inside Explorer's deluxe steel cabinet. Level "C" includes a sheet metal superstructure, a 5-card, gold plated S-100 extension PC board that plugs into the motherboard. Just add required number of S-100 connectors.



Explorer/85 With Level "C" Card Cage.

LEVEL "D" SPECIFICATIONS

Level "D" provides 4k of RAM, power supply regulation, filtering decoupling components and sockets to expand your Explorer/85 memory to 4k (plus the original 256 bytes located in the 8155A). The static RAM can be located anywhere from 0000 to EFFF in 4k blocks.

LEVEL "E" SPECIFICATIONS

Level "E" adds sockets for 8k of EPROM to use the popular Intel 2716 or the TI 2516. It includes all sockets, power supply regulator, heat sink, filtering and decoupling components. Sockets may also be used for 2k x 8 RAM IC's (allowing for up to 12k of onboard RAM).

DISK DRIVE SPECIFICATIONS

- 8" CONTROL DATA CORP. professional drive.
- LSI controller.
- Write protect.
- Single or double density.
- Data capacity: 401,016 bytes (SD), 802,032 bytes (DD), unformatted.
- Access time: 25ms (one track).

DISK CONTROLLER/ I/O BOARD SPECIFICATIONS

- Controls up to four 8" drives.
- 1771A LSI (SD) floppy disk controller.
- Onboard data separator (IBM compatible).
- 2 Serial I/O ports
- Autoboot to disk system when system reset.
- 2716 PROM socket included for use in custom applications.
- Onboard crystal controlled.
- Onboard I/O baud rate generators to 9600 baud.
- Double-sided PC board (glass epoxy.)

DISK DRIVE CABINET/POWER SUPPLY

- Deluxe steel cabinet with individual power supply for maximum reliability and stability.

ORDER A COORDINATED EXPLORER/85 APPLICATIONS PAK!

Beginner's Pak (Save $26.00!) — Buy Level "A" (Terminal Version) with Monitor Source Listing and AP-1 5-amp Power Supply: (regular price $199.95), now at SPECIAL PRICE: **$169.95** plus post. & insur.

Experimenter's Pak II (Save $53.40!) — Buy Level "A" (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level "A" Hex Monitor Source Listing, and AP-1 5-amp Power Supply: (regular price $279.35), all at SPECIAL PRICE: **$219.95** plus post. & insur.

Special Microsoft BASIC Pak (Save $103.00!) — Includes Level "A" (Terminal Version), Level "B", Level "D" (4k RAM), Level "E", 8k Microsoft in ROM, Intel 8085 User Manual, Level "A" Monitor Source Listing, and AP-1 5-amp Power Supply: (regular price $439.70), now yours at SPECIAL PRICE: **$329.95** plus post. & insur.

ADD A TERMINAL WITH CABINET, GET A FREE RF MODULATOR: Save over $114 at this SPECIAL PRICE: **$499.95** plus post. & insur.

Special 8" Disk Edition Explorer/85 (Save over $104!) — Includes disk-version Level "A", Level "B", two S-100 connectors and brackets, disk controller, 64k RAM, AP-1 5-amp power supply, Explorer/85 deluxe steel cabinet, cabinet fan, 8" SD/DD disk drive from famous CONTROL DATA CORP. (not a hobby brand!), drive cabinet with power supply, and drive cable set-up for two drives. This package includes everything but terminal and printers (see coupon for them). Regular price $1630.30, all yours in kit at SPECIAL PRICE: **$1499.95** plus post. & insur. Wired and tested, only **$1799.95.**

Special! Complete Business Software Pak (Save $625.00!) — Includes CP/M 2.0, Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package: (regular price $1325), yours now at SPECIAL PRICE: **$699.95.**

Please send the items checked below:

- ☐ **Explorer/85 Level "A" kit** (Terminal Version) . . . **$129.95** plus $3 post. & insur.
- ☐ **Explorer/85 Level "A" kit** (Hex Keypad/Display Version) . . . **$129.95** plus $3 post. & insur.
- ☐ **8k Microsoft BASIC** on cassette tape. **$64.95** postpaid.
- ☐ **8k Microsoft BASIC in ROM kit** (requires Levels "B", "D" and "E") . . . **$99.95** plus $2 post. & insur.
- ☐ **Level "B" (S-100) kit** . . . **$49.95** plus $2 post. & insur.
- ☐ **Level "C" (S-100 6-card expander) kit** . . . **$39.95** plus $2 post. & insur.
- ☐ **Level "D" (4k RAM) kit** . . . **$69.95** plus $2 post. & insur.
- ☐ **Level "E" (EPROM/ROM) kit** . . . **$5.95** plus 50¢ p&h.
- ☐ **Deluxe Steel Cabinet** for Explorer/85 . . . **$49.95** plus $3 post. & insur.
  - ☐ Fan For Cabinet . . . **$15.00** plus $1.50 post. & insur.
- ☐ **ASCII Keyboard/Computer Terminal kit:** features a full 128 character set, u&l case; full cursor control; 75 ohm video output; convertible to baudot output; selectable baud rate, RS232-C or 20 ma. I/O, 32 or 64 character by 16 line formats, and can be used with either a CRT monitor or a TV set (if you have an RF modulator) . . . **$149.95** plus $3.00 post. & insur.
  - ☐ **DeLuxe Steel Cabinet** for ASCII keyboard/terminal . . . **$19.95** plus $2.50 post. & insur.
- ☐ **New! Terminal/Monitor:** (See photo) Same features as above, except 12" monitor with keyboard and terminal is in deluxe single cabinet; kit . . . **$399.95** plus $7 post. & insur.
- ☐ **Hazeltine terminals:** Our prices too low to quote — **CALL US**
- ☐ **Lear-Sigler terminals/printers:** Our prices too low to quote: **CALL US**
- ☐ **Hex Keypad/Display kit** . . . **$69.95** plus $2 post. & insur.
- ☐ **AP-1 Power Supply kit** ±8V @ 5 amps) in deluxe steel cabinet . . . **$39.95** plus $2 post. & insur.
- ☐ **Gold Plated S-100 Bus Connectors** . . . **$4.85** each, postpaid.
- ☐ **RF Modulator kit** (allows you to use your TV set as a monitor) . . . $8.95 **postpaid.**
- ☐ **16k RAM kit** (S-100 board expands to 64k) . . . **$199.95** plus $2 post. & insur.
- ☐ **32k RAM kit** . . . **$299.95** plus $2 post. & insur.
- ☐ **48k RAM kit** . . . **$399.95** plus $2 post. & insur.
- ☐ **64k RAM kit** . . . **$499.95** plus $2 post. & insur.
- ☐ **16k RAM Expansion kit** (to expand any of the above in 16k blocks up to 64k) . . . **$99.95** plus $2 post. & insur. each.
- ☐ **Intel 8085 cpu Users' Manual** . . . **$7.50** postpaid.
- ☐ **12" Video Monitor** (10MHz bandwidth) . . . **$139.95** plus $5 post. & insur.
- ☐ **Beginner's Pak** (see above) **$169.95** plus $4 post. & insur.
- ☐ **Experimenter's Pak** (see above) . . . **$219.95** plus $6 post. & insur.
- ☐ **Special Microsoft BASIC Pak Without Terminal** (see above) . . . **$329.95** plus $7 post. & insur.
- ☐ Same as above, plus **ASCII Keyboard Terminal With Cabinet, Get Free RF Modulator** (see above) . . . **$499.95** plus $10 post. & insur.
- ☐ **Special 8" Disk Edition Explorer/85** (see above) . . . **$1499.95** plus $26 post. & insur.
  - ☐ **Wired & Tested** . . . **$1799.95** plus $26 post. & insur.
- ☐ **Extra 8" CDC Floppy Drives** . . . **$499.95** plus $12 post. & insur.
  - ☐ **Cabinet & Power Supply For Drive** . . . **$69.95** plus $3 post. & insur.
- ☐ **Drive Cable Set-up For Two Drives** . . . **$25** plus $1.50 post. & insur.
- ☐ **Disk Controller Board With I/O Ports** . . . **$199.95** plus $2 post. & insur.
- ☐ **Special: Complete Business Software Pak** (see above) . . . **$699.96** postpaid.

SOLD SEPARATELY: Dept. KB1

- ☐ **CP/M 1.4** . . . **$100** postpaid.
- ☐ **CP/M 2.0** . . . **$150** postpaid.
- ☐ **Microsoft BASIC** . . . **$325** postpaid.
- ☐ **Intel 8085 cpu User Manual** . . . $7.50 **postpaid.**
- ☐ **Level "A" Monitor Source Listing** . . . **$25** postpaid.

Continental U.S.A. Credit Card Buyers Outside Connecticut

CALL TOLL FREE: 800-243-7428

To Order From Connecticut Or For Technical Assistance, call (203) 354-9375

Total Enclosed (Conn res. add sales tax) $ _____

Paid By:

☐ Personal Check ☐ Cashier's Check/Money Order

☐ VISA ☐ Master Charge (Bank No. — — — —)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

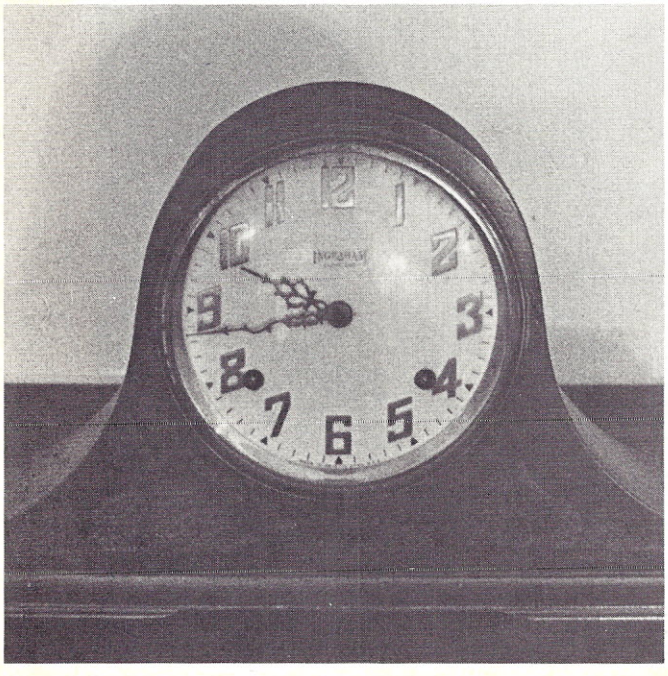
Address _____

City _____

State _____ Zip _____

NETRONICS Research & Development Ltd.
333 Litchfield Road, New Milford, CT 06776

There's two things you can't afford to waste.





These days, everyone is more conscious of the need to conserve time and money. That's why mail order shopping just naturally makes good sense.

At Hobbyworld Electronics, the number one name in mail order electronics, we're proud to offer the widest selection of computer systems, software, and electronic components. Fast service, fair prices, and our exclusive 120 day warranty are your assurance of satisfaction every time you order.

So give us a call, or write for your FREE Hobbyworld catalogue TODAY, because your time and money are too important to waste.

HOBBYWORLD® ELECTRONICS, INC.

✓10

Notice Our Difference

19511 Business Center Drive
Northridge, California 91324

In United States: (800) 423-5387
In California: (800) 382-3651 and
Local/Outside U.S.A. (213) 886-9200

FREE Hobbyworld Catalogue

Name_____

Address_____

City_____

State_____ **Zip**_____

Dept. 1

✓ Reader Service—see page 226

NEW!

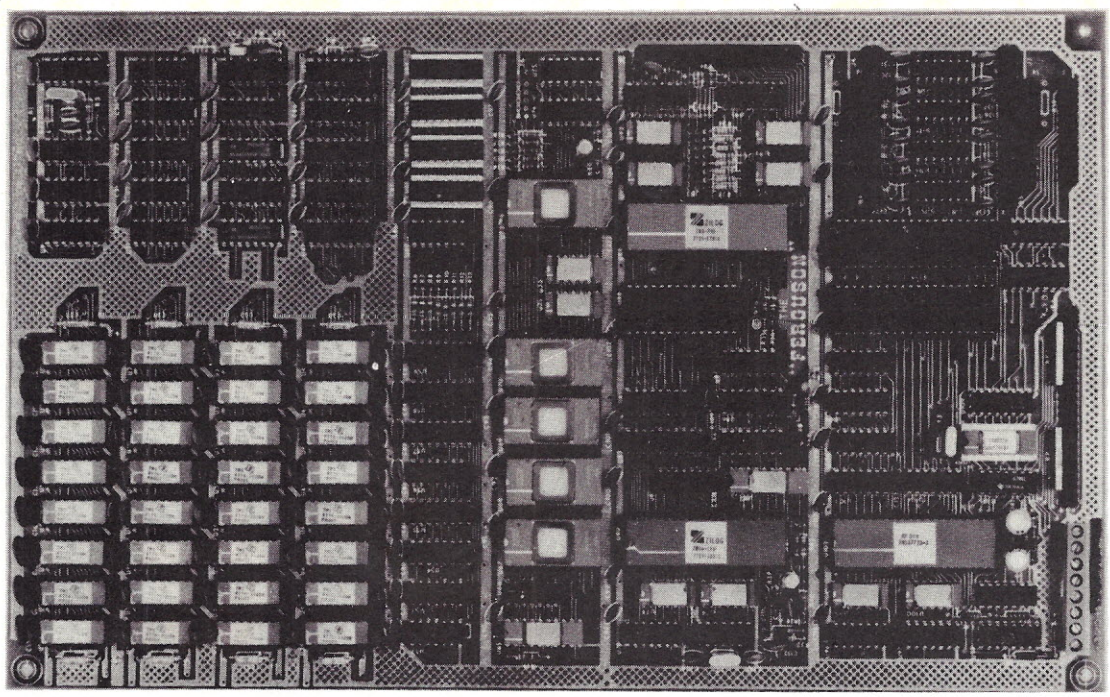
"THE BIG BOARD"

OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

SINGLE BOARD COMPUTER KIT!

NEW!

Z-80 CPU! 64K RAM!



PARTIAL KIT
For All Sockets Installed
And Soldered Add $50.

THE FERGUSON PROJECT: Three years in the works, and maybe too good to be true. A tribute to hard headed, no compromise, high performance, American engineering! The Big Board gives you all the most needed computing features on one board at a very reasonable cost. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed! Take a Big Board, add a couple of 8 inch disc drives, power supply, an enclosure, C.R.T., and you have a total Business System for about 1/3 the cost you might expect to pay.

$649.00 ** (64K KIT BASIC I/0)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM'S. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $85.

BASIC I/O

Consists of a separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. User selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $29.95

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $14.95

SYSTEM COMPARISON

64K RAM KIT	$370.00
80 x 24 Video Kit	365.00
Floppy Disk Controller Kit	235.00
Z-80 CPU Kit	185.95
SER & PAR. I/O	129.95
S-100 Mother Board	45.00
SUB TOTAL	$1330.90

Talk about bangs per buck! The prices shown for S100 kits were taken from the July 1980 BYTE. This will give some basis for comparison between the Big Board and a similar system implementation on the S100 Buss.

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. modified by MICRONIX SYSTEMS to run on Big Board is available for $150.00.

PC BOARD

Blank PC Board with Rom Set and Full Documentation. $195.00

PFM 3.0 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.0 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search. PFM occupies one of the four 2716 EPROM locations provided.

Z-80 is a Trademark of Zilog.

Digital Research Computers
(OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Initial shipments will be made approximately 3 to 5 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a $75 deposit. Balance UPS COD. The $75 deposit assures your place in line for the initial production run of Big Board.

*TRADEMARK OF DIGITAL RESEARCH. NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE ORIGINATORS OF CPM SOFTWARE
**1 TO 4 PIECE DOMESTIC USA PRICE.

U.K. AND EUROPE: CONTACT MACLIN-ZAND LTD. 38 MOUNT PLEASANT — LONDON WCIX OAP

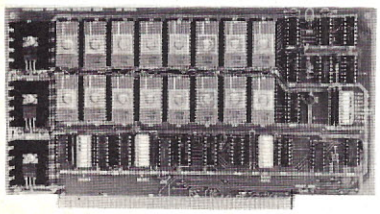
DIGITAL RESEARCH COMPUTERS

(214) 271-3538

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

32K S-100 EPROM CARD

NEW!



$74.95 KIT

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $14.95 EA. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

16K DYNAMIC RAM PARTIALS

LOOK! **INTEL 2108 8K X 1 RAMS** LOOK!

8 FOR $9.95 32 FOR $35

FACTORY PRIME!

Huge special purchase of INTEL Dynamic RAM's. These are 2108-4, 300NS, 8K, Ceramic DIP. The 2108 is the INTEL 2116 (16K) tested for either upper or lower 8K only. These are factory prime. Full Spec. See INTEL 1978 Cat. for details or Memory Design Handbook for application data. Both IMSAI and EXTENSYS did mfg. S-100 RAM boards using these devices. — P.S. These devices will not work in the SD EPANDORAM™. Please specify upper or lower 8K. (S1626 or S1627). A super easy RAM to interface to a Z80, 16 PIN DIP

FOR 4MHZ **PRICE CUT!** **LOW POWER - 300NS 2114 RAM SALE!** **8 FOR $37.50**

4K STATIC RAM'S. MAJOR BRAND, NEW PARTS.

These are the most sought after 2114's, LOW POWER and 300NS FAST.

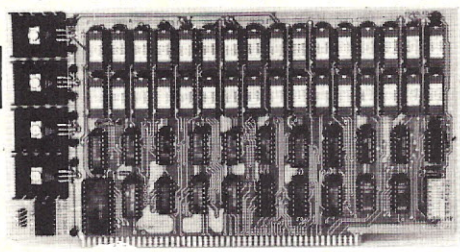
8 FOR $37.50

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$199.95 KIT

FOR 4MHZ ADD $10



KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-**$33**

LOW PROFILE SOCKET SET-**$12**

SUPPORT IC'S & CAPS-**$19.95**

ASSEMBLED & TESTED-**ADD $35**

OUR #1 SELLING RAM BOARD!

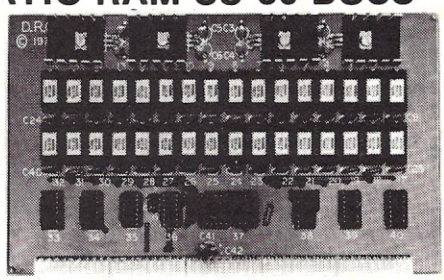
16K STATIC RAM SS-50 BUSS

PRICE CUT!

$210 KIT

FULLY STATIC!

FOR 2MHZ ADD $10



FOR SWTPC 6800 BUSS!

ASSEMBLED AND TESTED - $35

KIT FEATURES:

1. Addressable on 16K Boundaries
2. Uses 2114 Static Ram
3. Fully Bypassed
4. Double sided PC Board. Solder mask and silk screened layout.
5. All Parts and Sockets included
6. Low Power: Under 1.5 Amps Typical

BLANK PC BOARD—**$30** COMPLETE SOCKET SET—**$12**

SUPPORT IC'S AND CAPS—**$19.95**

STEREO! S-100 SOUND COMPUTER BOARD

NEW! NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

COMPLETE KIT! $84.95 (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $31

KIT FEATURES:

- ★ TWO GI SOUND COMPUTER IC'S.
- ★ FOUR PARALLEL I/O PORTS ON BOARD.
- ★ USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- ★ ON BOARD PROTO TYPING AREA.
- ★ ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- ★ PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- ★ EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
- ★ USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716. Diskette - **$24.95** 2708 - **$19.95** 2716 - **$29.95.** Diskette includes the source. EPROM'S are ORG at E000H.

4K DYNAMIC RAM BLOWOUT!

SAME AS INTEL 2107B!

4K RAMS AT AN UNBELIEVABLE 50¢ EACH!!!

Prime, new, National Semi., 1979 date coded, full spec. parts. N.S. #MM5280-5N. Same as INTEL 2107B-4, T.I. TMS4060, NEC uPD411, etc. We bought a HUGE QTY. from a West Coast Distributor at truly DISTRESS PRICES! One of the most popular and reliable RAM's ever made. These parts have been used by almost all Major Computer Main Frame Mfg. the world over! Arranged as 4K x 1, 270 NS Access Time, 22 Pin Dip. These units DO NOT use multiplexed addressing, thus making REFRESH and other timing very simple. See INTEL MEMORY DESIGN HANDBOOK for full application notes. The NAT. SEMI. MEMORY DATA BOOK is available at most Radio Shack Stores. Prime units in original factory tubes!

(With Pin Out Data) #5280-5N 4096 BITS x 1 270 NS ACCESS

8 FOR $4.95 32 FOR $16

FACTORY CASE (450 PCS) — $180

Sockets Special: 22 Pin Low Profile (With Purchase of 5280's) 8 FOR $1.

COMPUTER PARTS SPECIALS

74LS175 - **.99**
74LS240 - **1.79**
74LS241 - **1.79**
74LS244 - **1.79**
74LS373 - **1.99**

8035 Intel Single Chip CPU - **5.95**
Signetics 2901 4 Bit Slice - **6.95**
AMD 2903 4 Bit Super Slice - **12.50**
AMD 29705 Dual Port RAM - **8.95**

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A tantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **$11.95** **PRICE CUT!**

SPECIAL OFFER: ~~$14.95~~ each Add $3 for 60 page Data Manual.

Digital Research Computers

(OF TEXAS)

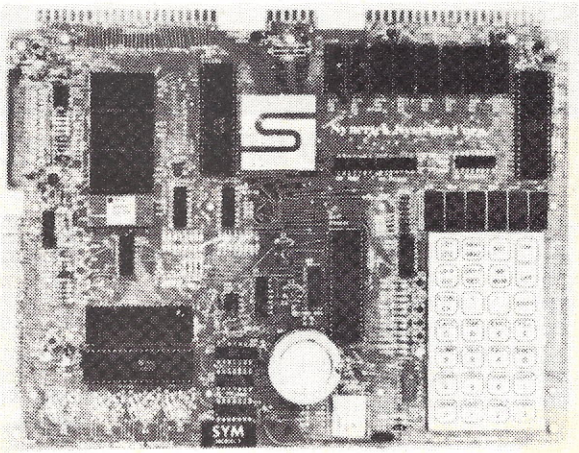
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Add $1.50 postage. We pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

*TRADEMARK OF DIGITAL RESEARCH. NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE SUPPLIERS OF CPM SOFTWARE.

SYM-1, 6502-BASED MICROCOMPUTER

- FULLY-ASSEMBLED AND COMPLETELY INTEGRATED SYSTEM that's ready-to-use
- ALL LSI IC'S ARE IN SOCKETS
- 28 DOUBLE-FUNCTION KEYPAD INCLUDING UP TO 24 "SPECIAL" FUNCTIONS
- EASY-TO-VIEW 6-DIGIT HEX LED DISPLAY
- KIM-1* HARDWARE COMPATIBILITY
  The powerful 6502 8-Bit MICROPROCESSOR whose advanced architectural features have made it one of the largest selling "micros" on the market today.
- THREE ON-BOARD PROGRAMMABLE INTERVAL TIMERS available to the user, expandable to five on-board.
- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes.
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
  —Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 1500 Baud)
  —Full duplex 20mA Teletype Interface
  —System Expansion Bus Interface
  —TV Controller Board Interface
  —CRT Compatible Interface (RS-232)
- APPLICATION PORT: 15 Bi-directional TTL Lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD



Synertek has enhanced KIM-1* software as well as the hardware. The software has simplified the user interface. The basic SYM-1 system is programmed in machine language. Monitor status is easily accessible, and the monitor gives the keypad user the same full functional capability of the TTY user. The SYM-1 has everything the KIM-1* has to offer, plus so much more that we cannot begin to tell you here. So, if you want to know more, the SYM-1 User Manual is available, separately.

SYM-1 Complete w/manuals **$229.00**
SYM-1 User Manual Only **$7.00**
SYM-1 Expansion **$60.00**

Expansion includes 3K of 2114 RAM chips and 1-6522 I/O chip.

SYM-1 Manuals: The well organized documentation package is complete and easy-to-understand.

SYM-1 CAN GROW AS YOU GROW. It's the system to BUILD-ON. Expansion features that are available:

BAS-1 8K Basic ROM (Microsoft Basic) **$89.00**
KTM-2 (Complete terminal less monitor) **$319.00**

QUALITY EXPANSION BOARDS DESIGNED SPECIFICALLY FOR KIM-1, SYM-1 & AIM 65

These boards are set up for use with a regulated power supply such as the one below, but, provisions have been made so that you can add onboard regulators for use with an unregulated power supply. But, because of unreliability, we do not recommend the use of onboard regulators. All I.C.'s are socketed for ease of maintenance. *All boards carry full 90-day warranty.*

All products that we manufacture are designed to meet or exceed industrial standards. All components are first qualtiy and meet full manufacturer's specifications. All this and an extended burn-in is done to reduce the normal percentage of field failures by up to 75%. To you, this means the chance of inconvenience and lost time due to a failure is very rare; but, if it should happen, we guarantee a turn-around time of less than forty-eight hours for repair.

Our money back guarantee: If, for any reason you wish to return any board that you have purchased directly from us within ten (10) days after receipt, complete, in original condition, and in original shipping carton; we will give you a complete credit or refund less a $10.00 restocking charge per board.

VAK-1 8-SLOT MOTHERBOARD

This motherboard uses the KIM-4* bus structure. It provides eight (8) expansion board sockets with rigid card cage. Separate jacks for audio cassette, TTY and power supply are provided. Fully buffered bus.

VAK-1 Motherboard **$139.00**

VAK-2/4 16K STATIC RAM BOARD

This board using 2114 RAMs is configured in two (2) separately addressable 8K blocks with individual write-protect switches.

VAK-2 16K RAM Board with only 8K of RAM (½ populated) **$239.00**
VAK-3 Complete set of chips to expand above board to 16K **$125.00**
VAK-4 Fully populated 16K RAM **$325.00**

VAK-5 2708 EPROM PROGRAMMER

This board requires a +5 VDC and ±12 VDC, but has a DC to DC multiplyer so there is no need for an additional power supply. All software is resident in on-board ROM, and has a zero-insertion socket.

VAK-5 2708 EPROM Programmer **$249.00**

VAK-6 EPROM BOARD

This board will hold 8K of 2708 or 2758, or 16K of 2716 or 2516 EPROMs. *EPROMs not included.*

VAK-6 EPROM Board **$119.00**

VAK-7 COMPLETE FLOPPY-DISK SYSTEM — $1299.00

See May Kilobaud for details

VAK-8 PROTYPING BOARD

This board allows you to create your own interfaces to plug into the motherboard. Etched circuitry is provided for regulators, address and data bus drivers; with a large area for either wire-wrapped or soldered IC circuitry.

VAK-8 Protyping Board **$39.00**

POWER SUPPLIES

ALL POWER SUPPLIES are totally enclosed with grounded enclosures for safety, AC power cord, and carry a full 2-year warranty.

FULL SYSTEM POWER SUPPLY

This power supply will handle a microcomputer and up to 65K of our VAK-4 RAM. ADDITIONAL FEATURES ARE: Over voltage Protection on 5 volts, fused, AC on/off switch. Equivalent to units selling for $225.00 or more.

Provides +5 VDC @ 10 Amps & ±12 VDC @ 1 Amp
VAK-EPS Power Supply **$119.00**

VAK-EPS/AIM — same as VAK-EPS but w/additional 24 volt unregulated (specifically for AIM 65) **$149.00**

KIM-1* Custom P.S. provides 5 VDC @ 1.2 Amps and +12 VDC @ .1 Amps
KCP-1 Power Supply **$39.00**

*KIM is a product of MOS Technology

Add $2.50 for shipping & handling for all except AIM 65.

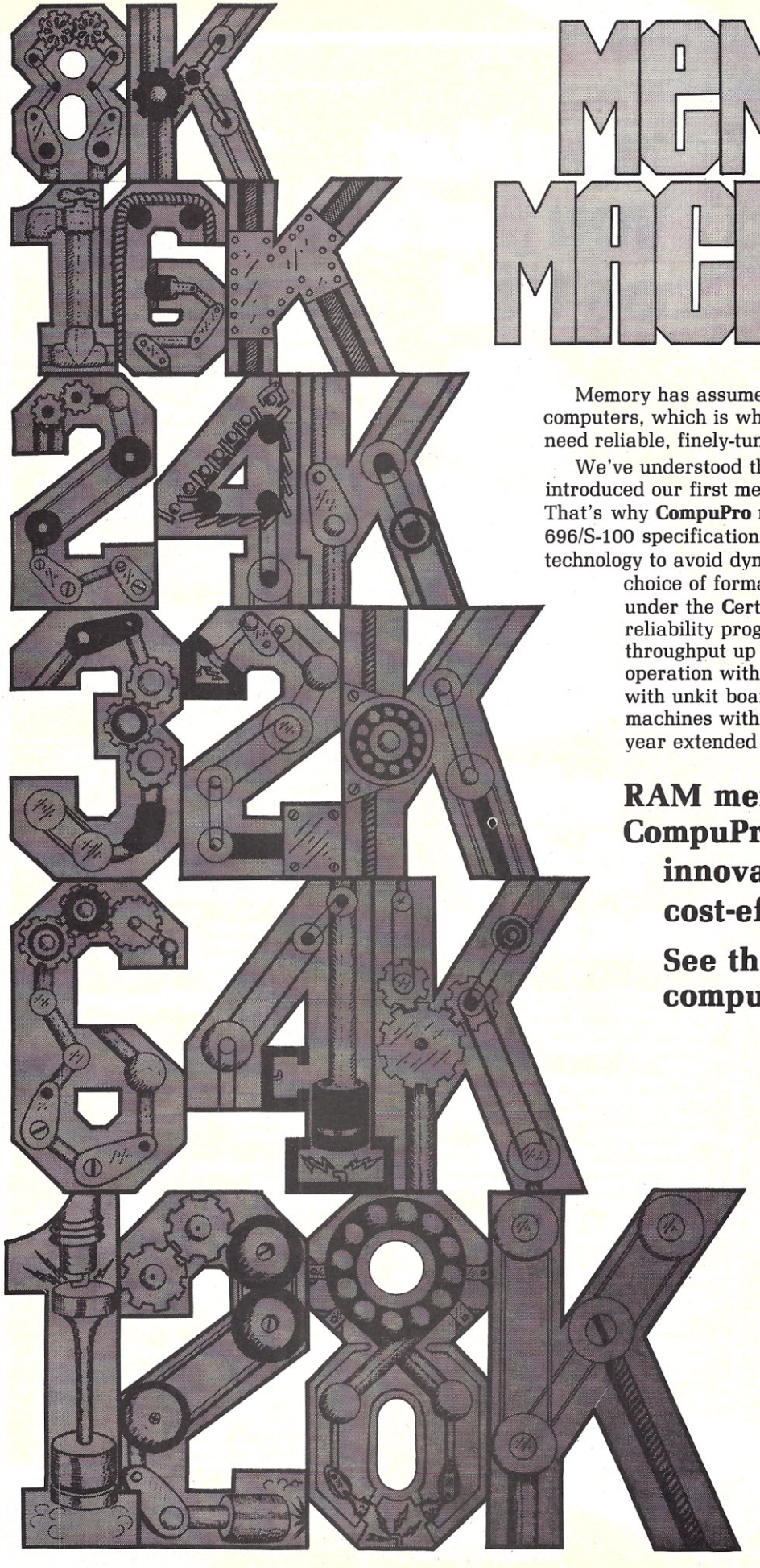
RNB ENTERPRISES INCORPORATED

52

WE'VE EXPANDED AGAIN!
NOTE OUR NEW ADDRESS.
2951 W. Fairmount Avenue
Phoenix AZ. 85017
(602)265-7564

VISA

master charge



MEMORY MACHINES

Memory has assumed tremendous importance in today's computers, which is why you don't just need memory: you need reliable, finely-tuned, precision machines.

We've understood the importance of memory since we introduced our first memory board well over 5 years ago. That's why **CompuPro** memory conforms fully to all IEEE 696/S-100 specifications . . . uses low power static technology to avoid dynamic timing problems . . . comes in a choice of formats (**unkit, assembled**, or qualified under the **C**ertified **S**ystem **C**omponent high-reliability program) . . . and zips along to keep your throughput up where it should be (10 MHz operation with CSC and assembled boards, 5 MHz with unkit boards). We back these precision machines with a standard 1 year warranty, and 2 year extended warranty for CSC boards.

RAM memory machines from CompuPro couple experience, innovative engineering, and cost-effectiveness.

See them in person at finer computer stores world-wide.

CompuPro™

OAKLAND AIRPORT, CA 94614

from

GODBOUT ELECTRONICS

✓ 42

Prices (assembled and tested units): **8K RAM 2A, $189; 16K RAM 14*, $349; 16K RAM 20-16**, $399; 24K RAM 20-24**, $539; 32K RAM 20-32**, $699.** Write for prices on **unkits** and **CSC** boards. **128K RAM 21-128*** (CSC only), **$2795.** Also available in 64K and 96K configurations. For 24 hour VISA® /Mastercard® orders, call **(415) 562-0636.**

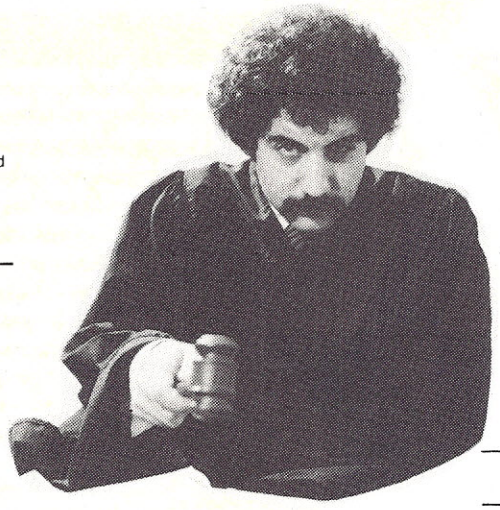
*With IEEE extended addressing

**Use with IEEE extended addressing systems or bank select systems

✓ Reader Service—see page 226

SEND FOR OUR FREE CATALOG

CompuMart let's you put'em on trial



Printers

ANNADEX.

132 col. printer. High Quality at a super price. Dot matrix, serial parallel & current loop standard. 180 c.p.s. Bi-Directional

Memory Integrated Circuits - Call for Qty. discounts when ordering over 50 units.

Motorola 4116 (200 Nanosecond, Plastic) **$4.50 EA.**
Fairchild 2114 (Standard Power, Plastic) **$4.50 EA.**

NEW From Integral Data The IDS 445 Printer

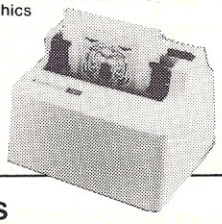
So new all we can tell you is that it's fantastic. Priced lower than the 440 and equipped with a better print head. Advanced technology strikes!

IDS 445 w/Graphics Capabilities **$894**
IDS 445 w/o Graphics Capabilities **$795**

The IDS 460

Since its introduction 5 months ago this printer has already proved itself. Features include: Correspon dence quality printing, High-resolution graphics capability, programmable print justification —a great printer.

$1,295



CENTRONICS PRINTERS

New! The incredible Model 737- Correspondence and Draft Quality Printing for Under $1,000. This is the first printer in its class to offer print quality suitable for text processing, plus the performance and application flexibility required for data processing.

737-1 (Parallel Interface)— **$899**

737-3 (Serial Interface) **$1,045**

Tractor Feed Printer- Centronics' Most Popular Model. Perfect for the needs of a small business sytesm. Recommended by Apple and Radio Shack. **$1,079**

FREE Cable with purchase of any Centronics printer.

The Omni 810 Printer from Texas Instruments

TI Omni 820 Receive-Only (RO) Package. Includes machine-mounted paper tray and cable. A compressed print option and device forms control are standard features. **$2,155**

TI Omni 820 Keyboard Send Receive (KSR) Package comes with full ASCII keyboard with numeric key-pad and an EIA cable with autospeed select. **$2,395**

NEC The First Name in Letter Quality Printers.

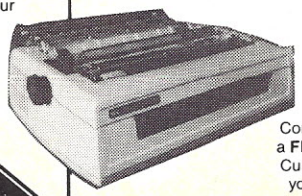
CompuMart offers beautiful print quality with NEC Spinwriter terminals. The Spinwriters, both KSR and RO versions, give unsurpassed hard copy output. CompuMart offers a complete range of NEC Spin-writers — Call our expert salesforce.

Send for our DEC LSI-11 Systems Catalog

with 10 day free return

CompuMart has been selling computers by mail since 1971. Our thousands of satisfied customers rely on CompuMart for services not generally available from the others. Namely:

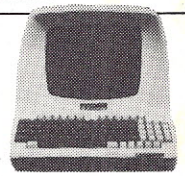
- Product Selection/Each product advertised by CompuMart has been evaluated by our in-house staff for best price, performance, and supplier reliability.
- Return Privilege/After receipt of our products, you are protected by CompuMart's exclusive, 10-day return priviledge good for all products except software.
- Support/Our Customer Service Dept. and expert technicians are always there to assist you by phone or at CompuMart's outlets. Our knowledgeable phone sales force can provide you with detailed information and complete product specifications.
- Phone Ordering/For added convenience, CompuMart maintains a toll-free ordering number. 1-800-343-5504.
- Phones open M T W Th F 8:30 a.m. - 7:00 p.m. Sat. 11:00 a.m. - 4:00 p.m.



Compumart will throw in a **FREE** fabric ribbon and Currier 72 element when you buy a NEC from us.

Terminals

NEW from Lear Siegler!



IT's here—IT is the difference between too smart and too dumb. IT is the new Intermediate Terminal from Lear Siegler.

We've got the following Lear Siegler Terminals In Stock at prices too low to print—**Call** for quotes.

ADM-3A Industries favorite dumb terminal for some very smart reasons.

ADM-3A.+ New from Lear Siegler. CALL!

ADM-31. The terminal that's too smart to be considered dumb.

ADM-42. Available with keyboard or without, semi intelligent terminal offering tremendous user flexibility. The optional configurations are amazing. **Call for details.**

Limited Time Offer We've slashed our Hazeltine prices again!

Hazeltine 1410	List $850	CompuMart **$749**
Hazeltine 1420	List $995	CompuMart **$825**
Hazeltine 1500	List $1095	CompuMart **$965**
Hazeltine 1510	List $1395	CompuMart **$1135**
Hazeltine 1520	List $1585	CompuMart **$1199**
Hazeltine 1552	List $1395	CompuMart **$1235**

Calculators

HEWLETT-PACKARD'S HP-41C

HP-41C Calculator **$288.00**

The System
Memory Modules. For storing programs or up to 2,000 lines of program memory **$45.00**

"Extra Smart" Card Reader. Records programs and data back onto blank mag-cards **$199.00**

The Printer. Upper and Lower case, High resolution plotting, Portable Thermal operation **$355.00**

Application Modules . . . . . **$45.00 EACH**

Texas Instruments TI-99/4 Home Computer

Save $300 on this 16-Bit computer with monitor

TI-99/4 w/o Monitor **$659**

NOVATION CAT™

ACCOUSTIC MODEM

- Answer Originate
- Bell 108
- 300 Baud
- Low Profile Design

Looks good, works great! **$179.00**

NEW! D-CAT

Direct Coupler from NOVATION **$199.**

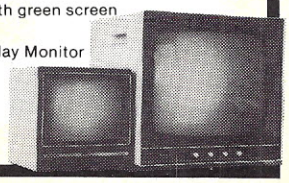
Monitors

EXCLUSIVE from CompuMart! Special Offer. Zenith Color Video Monitor for $379!

NEW FROM SANYO — Four Great Monitors at Low CompuMart Prices.

Sanyo's new line of CRT data display monitors are specifically designed for the display of alpha-numeric or graphic data.

9" Sanyo Monitor **$169**
12" Sanyo Monitor **$289**
12" Sanyo Monitor with green screen **$299**
13" Sanyo Color Display Monitor **$495**



Computers



apple

We carry the most complete inventory of Apple computers, peripherals, and software. CALL!

Our Best Selling Apple System:

Save over $250 on our most popular Apple System. System I includes a 48K Apple II, Apple Disk & Controller, and a Sup R Mod RF Modulator.

List: $2,020

Compumart Sale Price: $1,769

New from Apple for the Apple II:

DOS 3-3 Convert disks to 16 sector format for 23% more storage and faster access **$60**

Apple Plot. The perfect graphic complement for Visicalc.	$70
Dow Jones News & Quotes	$95
Adventure (Uses 48K)	$35
DOS Tool Kit	$75
Apple Fortran	$200
Silentype Printer w/Xface	$595
Visicalc	$149
Tax Planner	$120

From Symtech & Info Unlimited

Super Sound Generator (mono) $159	(stereo) $259
Light Pen	$249
X-10 Controller (plugs into paddle port)	$49

From **Personal Software**

Visicalc	$149
Desk top plan	$99

New from **Videx!** — Video Term 80 Col. x 24 line 7 x 9 matrix, plug in compatible board for the Apple II. Price **$325** without graphics EPROM. With graphics EPROM **$350.**

New from **MUSE**

The Voice	$39.95
Super Text	$99.00
Address Book	$49.95

Mountain Hardware — Expansion accessories for your Apple

Introl/X-10 System	$289
Super Talker	$299
The Music System	$545
ROM plus board w/keyboard filter	$199
Clock Calendar	$280
16 Channel A to D Converter	$350
Apple Expansion Chassis	$650
ROM Writer	$175
Miscellaneous Apple II Accessories:	
Easy Writer (80 col. need Videx)	$249
Easy Mover	$ 49
Easy Mailer	$ 69
Dysan Diskettes	ea. $ 5
S.S.M. Serial & Parallel Apple Interface	$225
ABT's Numeric Key Pad	$110

COMMODORE

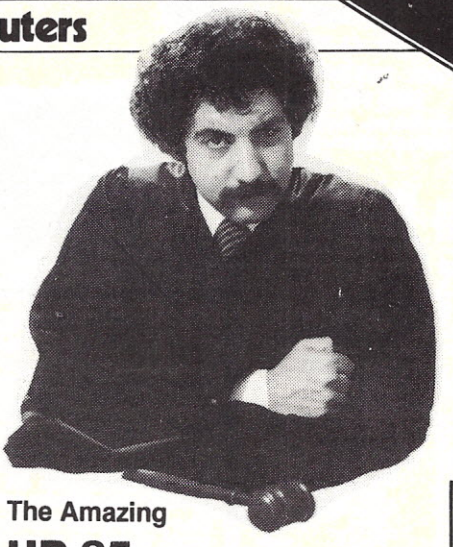
Buy direct from the biggest — Compumart has delivered more Commodore computers in the U.S. than any other dealer. We were Commodore's first dealer and carry everything Commodore manufactures. In stock for immediate delivery! Call us now for low prices and special deals.

NEW FOR PET:

Visicalc (Need 32K and a disk drive) **$199**

Word Pro 1, **$29.95** • Word Pro 2, **$99.95** •

Word Pro 3, **$199.95** • Word Pro 4, **$299.95** •

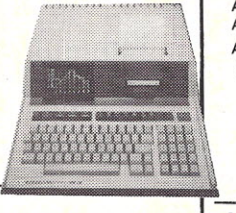


CompuMart STOCKS THE COMPLETE LINE OF MATROX PRODUCTS. CALL FOR SPECS.

The Amazing HP 85

Hewlett-Packard's Personal Computer for Industry. This extremely portable computer features extended BASIC to solve your problems quickly and efficiently along with an advanced graphics system to enhance communication.

We carry H.P. Peripherals (Disk Drives to Graphics Plotters) Enhancements: (BASIC Training, General Statistics, Financial Decision, Math, Linear Programming **$95 ea.**); HP-85 Accessories: (Enhancement ROMs, ROM drawer, Overhead Transparency Kit); Supplies: (Plotter Pens, Tape Cartridges); Interface Modules (HP-IB Interface, HP-IB Interconnect Cables, Serial (RS-232C) Interface Module).



We can get your every HP peripheral made for the HP-85. **CALL FOR COMPLETE DETAILS & SPECS.**

EXIDY SUPER SALE!

We want to clean out our inventory of Exidy computers and peripherals. To do this we've priced our Exidy equipment so low you'll have to call us for prices.

ROCKWELL AIM 65

The single board development system that's perfect in the classroom or lab.

Our AIM System includes: 4K AIM with BASIC interpretor assembler, Power Supply, Cassette recorder & Enclosure **$799.**

4K AIM — 65	$499
PL65 High Level Language	$125
Paper for the AIM (roll)	$ 2.50
Rockwell's 4-slot Motherboard (SALE)	$175

CompuMart's Microflex 65 System for your AIM Includes: Adapter Buffer Module w/ 4-slot module stack, 8K RAM module, 16K PROM/ROM module, Asynchronous communications Interface, & Power Supply **$1,299**

Call or write for our complete Microflex 65 brochure



Piggy-back for the AIM.

COMPUMART'S EXCLUSIVE ATARI SPECIALS.



3 Ways to save when you buy the Atari 800 from us. Choose from one of the following offers.

ATARI

1) **Free** 8K of memory with purchase. (So your Atari will come to you with 24K.)

2) **Free** 410 program recorder with purchase ($89.95 value).

3) $100 off Atari Disk Drive purchase.

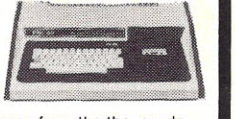
ATARI 800 Personal Computer System —

Comes with 800 Operators Manual, 16K RAM Memory module, 10 K ROM Operating System, power supply, TV Switch Box. **$950.**

PERIPHERALS

Atari 410 Program Recorder (FREE w/purchase of Atari 800)	$ 89.95
Atari 810 Disk Drive ($100 off with purchase)	699.95
New Dual Disk double density	1499.95
825 Printer (Centronics 737)	995.00
RS232 Interface w/Cable	249.95
NEW! Light Pens	74.95
New! Visicale for Atari	$199.

NEW! The PMC-80 The new 12K computer that's SOFTWARE COMPATIBLE with the TRS-80.*



Level II 16K at $645

Just think, now you can choose from the thousands of software packages already developed for the TRS-80 and run them on a computer costing only **$645.** But the PMC-80 is more than just a computer that accepts TRS-80 software. Its features include: Reads all Level II BASIC tapes. Reads all SYSTEM tapes. Full range of peripherals. Video output for monitor and TV. Optional FASTLOAD at 8000 baud. Optional Upper/Lower case. Call for complete specs.

*TRS-80 is a registered trademark of Tandy Radio Shack

IMPORTANT ORDERING INFORMATION All orders must include 4% shipping and handling. Mass. residents add 5% sales tax, Michigan residents 4% for sales tax.

TO ORDER CALL: 800-343-5504
In Mass. call 1-617-491-2700

Phones open from 8:30 a.m. to 7:00 p.m., Mon.-Fri.; 11:00 a.m. - 4:00 p.m. Sat. P.O.'s accepted from Dun & Bradstreet rated companies - shipment contingent upon receipt of signed purchase order. Sale prices valid for month of magazine date only - all prices subject to change without notice. Our Ann Arbor retail store is open 11:00 a.m. to 7:00 p.m. Tues.-Fri., 10:00 a.m. to 5:00 p.m. Saturdays. Stop by and visit.

COMPUMART

43

270 THIRD ST., DEPT. 133, P.O. BOX 568, CAMBRIDGE, MA. 02139

master charge

VISA

Member Computer Dealers Assoc.

We've had a reputation for dependability since 1971

Quest ELECTRONICS

✓44

P.O. Box 4430S
Santa Clara, CA 95054
Will calls: 2322 Walsh Ave.
(408) 988-1640

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

INTEGRATED CIRCUITS

7400TTL		LM323K-5	5.95	CD4026	2.50	4116 200ns	7.95
7400N	.19	LM320K-12	1.50	CD4027	.66	8/4116 200ns	49.00
7402N	.20	LM320K-15	1.50	CD4028	.85	2513B	6.30
7404N	.25	LM320T-5	1.35	CD4029	1.35	MM5262	.40
7409N	.23	LM320T-8	1.35	CD4030	.45	MM5280	3.00
7410N	.20	LM320T-12	1.35	CD4035	1.35	MM5320	9.95
7414N	.70	LM320T-15	1.35	CD4040	1.35	MM5330	5.94
7420N	.20	LM324N	1.40	CD4042	.85	PD411D-3	4.00
7422N	.39	LM339N	1.00	CD4043	.85	PD411D-4	5.00
7430N	.20	LM340K-5	1.35	CD4044	.85	P5101L	8.95
7442N	.58	LM340K-8	1.35	CD4046	1.67	4200A	9.95
7445N	.74	LM340K-12	1.35	CD4049	.45	82S25	2.90
7447N	.58	LM340K-15	1.35	CD4050	.49	91L02A	1.50
7448N	.77	LM340K-24	1.35	CD4051	1.13	HD0165-5	6.95
7450N	.20	LM340T-5	1.25	CD4060	1.42	MM57100	4.50
7474N	.35	LM340T-8	1.25	CD4066	.71	GIAY38500-1	9.95
7475N	.49	LM340T-12	1.25	CD4068	.40	MCM66751A	9.95
7485N	.88	LM340T-15	1.25	CD4069	.40	9368	3.50
7486N	1.85	LM340T-18	1.25	CD4070	.50	410D	10.00
7490N	.43	LM340T-24	1.25	CD4071	.45	416	16.00
7492N	.43	LM350	7.50	CD4072	.45		
7493N	.43	LM377	3.50	CD4073	.45	**CLOCKS**	
7495N	.69	LM379	5.00	CD4075	.45	MM5311	5.50
74100N	.69	LM380N	1.00	CD4076	1.65	MM5312	3.90
74107N	.35	LM381	1.60	CD4078	.40	MM5314	3.90
74121N	.34	LM382	1.60	CD4081	.35	MM5369	2.10
74123N	.59	LM383	.65	CD4082	.35	MM5841	14.45
74125N	.45	LM709H	.28	CD4116	.47	MM5865	7.95
74145N	.77	LM723H/N	.50	CD4490	5.50	CT7010	8.95
74150N	1.20	LM733N	.85	CD4507	1.00	CT7015	8.95
74151N	.69	LM741CH	.35	CD4510	1.02	MM5375AA/N	3.90
74154N	2.00	LM741N	.38	CD4511	.94	MM5375AG/N	4.90
74157N	.69	LM747H/N	.75	CD4515	2.52	7205	16.50
74161N	.87	LM748N	.35	CD4516	1.10	7207	7.50
74162N	1.25	LM1303N	1.75	CD4518	1.02	7208	15.95
74163N	.87	LM1304	1.10	CD4520	1.02	7209	4.95
74174N	.96	LM1305	1.27	CD4522	1.02	DS0026CN	3.75
74175N	.95	LM1307	2.00	CD4527	1.51	DS0056CN	3.75
74190N	1.15	LM1310	2.75	CD4528	.79	MM53104	2.50
74192N	.87	LM1458	.47	CD4553	3.50		
74193N	.85	LM1812	7.50	CD4566	2.25	**MICROPROCESSOR**	
74221N	2.75	LM1889	3.00	CD4583	2.35	6502	10.95
74298N	1.65	LM2111	1.75	CD4585	1.10	6504	9.95
74365N	.89	LM2902	2.25	CD40192	3.00	6522	9.95
74366N	.89	LM3900N	.60	74C00	.35	6800	6.95
74367N	.89	LM3905	1.75	74C04	.40	6802	11.95
		LM3909N	.95	74C10	.35	6820	4.95
74LS00 TTL		MC1458V	.50	74C14	1.95	6850	5.95
74LS00N	.35	NE592N	1.00	74C20	.35	8080A	5.95
74LS02N	.35	NE555V	.39	74C30	.35	8085	12.95
74LS04N	.55	NE556A	.85	74C48	2.25	8086	75.00
74LS05N	.40	NE565A	1.00	74C74	.85	Z80	9.95
74LS08N	.45	NE566V	1.50	74C76	1.75	Z80A	11.95
74LS10N	.45	NE567V	1.00	74C90	1.75	8212	2.90
74LS13N	.55	NE570B	4.75	74C93	1.75	8214	3.95
74LS14N	1.25	78L05	.60	74C154	3.00	8216	2.90
74LS20N	.45	78L08	.60	74C160	2.00	8224	3.45
74LS22N	.45	78M05	.85	74C175	1.35	8228	4.95
74LS28N	.45	75108	1.75	74C192	2.25	8251	6.95
74LS30N	.45	75491CN	.50	74C221	2.50	8253	15.00
74LS33N	.75	75492CN	.55	74C905	6.00	8255	5.75
74LS38N	.75	75494CN	.89	74C906	.75	8257	10.95
74LS74N	1.25			74C914	1.95	8259	14.95
74LS75N	1.00			74C922	6.00	1802CP plas.	13.95
74LS90N	1.00	**A to D CONVERTER**		74C923	6.00	1802DP plas.	17.95
74LS93N	1.00	80388	4.50	74C925	7.50	1861P	11.00
74LS95N	1.10	8700CJ	13.95	74C926	6.95	CDP1802CD	28.95
74LS107N	.65	8701CN	22.00	74C927	6.95	CDP1802D	35.00
74LS112N	.65	8750CJ	13.95			CDP1861	15.95
74LS113N	.45	LD130	9.95	**INTERFACE**			
74LS132N	.89	9400CJV/F	7.40	8095	.65	**UART/FIFO**	
74LS136N	.65	ICL7103	9.50	8096	.65	AY5-1013	5.50
74LS151N	1.10	ICL7107	14.25	8097	.65	AY5-1014	7.50
74LS155N	1.10			8098	.65	3341	6.95
74LS157N	1.10	**CMOS**		8T09	1.25		
74LS162N	1.65	CD4000	.25	8T10	4.50	**PROM**	
74LS163N	1.65	CD4001	.35	8T13	3.00	1702A	4.95
74LS174N	2.00	CD4002	.35	8T20	5.50	2513B upper case	8.75
74LS190N	1.25	CD4006	1.10	8T23	3.10	2708	7.75
74LS221N	2.50	CD4007	.35	8T24	3.53	2716T1	19.00
74LS258N	1.60	CD4008	.28	8T25	3.20	2716 Intel	23.00
74LS367N	1.65	CD4009	.45	8T26	1.69	8/2716 Intel	160.00
		CD4010	.45	8T28	2.75	2732	65.00
LINEAR		CD4011	.35	8T97	1.69	2758	22.50
CA3045	.90	CD4012	.28	8T98	1.69	8741A	60.00
CA3046	1.10	CD4013	.47			8748	65.00
CA3081	1.80	CD4014	1.25			8748-8	60.00
CA3082	1.90	CD4015	1.00	**MOS/MEMORY RAM**		8755A	55.00
CA3089	2.95	CD4016	.55	2101-1	2.95	N82S23	2.95
LM301AN/AH	.35	CD4017	1.05	2102-1	.55	N82S123	6.50
LM305H	.87	CD4018	.94	2102AL-4	1.34	N82S126	3.75
LM307N	.35	CD4019	.45	2102AN-2L	1.60	N82S129	8.50
LM308N	1.00	CD4020	1.02	2104A-4	4.95	N82S131	8.50
LM309K	1.50	CD4021	1.35	2107B-4	3.75	N82S136	8.75
LM311H/N	.90	CD4022	1.10	2111-1	3.75	N82S137	8.75
LM317T/K	3.75	CD4023	.28	2112-2	3.95	DM8577	2.90
LM318	1.35	CD4024	.75	2114L 300ns	6.75	8223	2.90
LM320K-5	1.50	CD4025	.28	2114L 450ns	5.95		

CONNECTORS

30 pin edge	2.50
44 pin edge	2.75
100 pin edge	4.50
100 pin edge WW	5.25

IC SOCKETS
Solder Tin Low Profile

PIN	1UP	PIN	1UP
8	.15	22	.30
14	.14	24	.35
16	.16	28	.42
18	.27	36	.58
20	.29	40	.57

2 level 14 pin ww .20

WIRE WRAP LEVEL 3

PIN		PIN	
14	.32	24	.86
16	.33	28	1.00
18	.57	40	1.23

CRYSTALS

1 MHz	4.50
2 MHz	4.50
4 MHz	4.25
5 MHz	4.25
10 MHz	4.25
18 MHz	3.90
20 MHz	3.90
32 MHz	3.90
32768 Hz	4.00
1.8432 MHz	4.50
3.5795 MHz	1.20
2.0100 MHz	1.95
2.097152 MHz	4.50
2.4576 MHz	4.50
3.2768 MHz	4.50
5.0688 MHz	4.50
5.185 MHz	4.50
5.7143 MHz	4.50
6.5536 MHz	4.50
14.31818 MHz	4.25
18.432 MHz	4.50
22.1184 MHz	4.50

KEYBOARD ENCODERS

AY5-2376	$12.50
AY5-3600	17.95
AY5-9100	10.50
AY5-9200	16.50
74C922	5.50
74C923	5.50
HD0165-5	6.95
AY5-9400	10.50

D Connectors RS232

DB25P	3.62
DB25S	5.20
Cover	1.67
DE9S	1.95
DA15P	2.10
DA15S	3.10
Complete Set	9.50

Hickok 3½ Digit LED multimeter 74.95
Stopwatch Kit 26.95
Auto Clock Kit 17.95
Digital Clock Kit 14.95

8K/16K Eprom Kit
(less PROMS) $89.00
Motherboard $39.00
Extender Board $15.00

RESISTORS ¼ watt 5%
10 per type .03
25 per type .025
100 per type .015
1000 per type .012
350 piece pack
5 per type 6.75

½ watt 5% per type .05

Televideo Terminal

Model 912	$845.00
Model 920	$945.00

Tiny Basic Experimentors Kit $10.00

BSR Controller $39.95
Connect your computer to the BSR Home Control System. Computer controlled ultrasonic transmitter for your BSR. Software for 1802 user.

KEYBOARDS

56 key ASCII keyboard kit	$67.50
Fully assembled	77.50
53 key ASCII keyboard kit	60.00
Fully assembled	70.00
Enclosure Plastic	14.95
Metal Enclosure	29.95

LEDS

Red T018	.15
Green, Yellow T018	.20
Jumbo Red	.20
Green, Orange, Yellow Jumbo	.25
Cliplite LED Mounting Clips 8/$1.25 (specify red, amber, green, yellow, clear)	

CONTINENTAL SPECIALTIES in stock
Complete line of breadboard test equip.
MAX-100 8 digit Freq. Ctr. $128.95

OK WIRE WRAP TOOLS in stock
Portable Multimeter $18.00
Complete line of AP Products in stock.

SPECIAL PRODUCTS

MM5865 Stopwatch Timer with 10 pg. spec.	9.00
PC board	7.50
Switches Mom. Pushbutton	.27
3 pos. slide	.25
Encoder HD0165-5	6.95
Paratronics 100A Logic Analyzer	**$425.00**
Model 10 Trigger Expander Kit	$229.00
Model 150 Bus Grabber Kit	$369.00
Clock Calendar Kit	**$23.95**
2.5 MHz Frequency Counter Kit	**$37.50**
30 MHz Frequency Counter Kit	**$47.75**

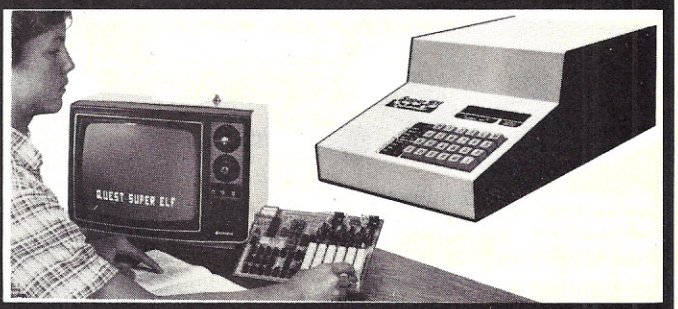
TRANSFORMERS

6V 300 ma	3.25
12 Volt 300 ma transformer	1.25
12.6V CT 600 ma	3.75
12V 250 ma wall plug	2.95
12V CT 250 ma wall plug	3.50
24V CT 400 ma	3.95
10V 1.2 amp wall plug	4.85
12V 6 amp	12.95
12V 500 ma wall plug	4.75
12V 1 amp wall plug	6.50
10/15 VAC 8/16 VA wall plug	9.75

DISPLAY LEDS

MAN1	CA	.270	2.90
MAN3	CC	.125	.39
MAN72/74	CA/CA	.300	1.00
DL704	CC	.300	1.25
DL707/DL707R	CA	.300	1.00
DL727/728	CA/CC	.500	1.90
DL747/750	CA/CC	.600	1.95
DL750	CC	.600	1.95
FND359	CC	.357	.70
FND509/507	CC/CA	.500	1.35
FND510/510	CC/CA	.500	.90
FND800/807	CC/CA	.800	2.20
3 digit Bubble			.60
4 digit Bubble			.80
DG8 Fluorescent			1.75
DG10 Fluorescent			1.75
10 digit display			1.25
7520 Clarex photocells			.39
TIL311 Hex			9.50
MAN3640	CC	.30	1.10
MAN4610	CA	.40	1.20
MAN4640	CC	.40	1.20
MAN4710	CA	.40	.95
MAN4740	CC	.40	1.20
MAN6640	CC	.56	2.95
MAN6710	CA	.60	1.35
MAN6740	CC	.60	1.35

MA1002A	**8.95**
MA1002E	**8.95**
MA1012A	**8.95**
102P3 transformer	**2.25**
MA1012A Transformer	**2.25**



RCA Cosmac 1802 Super Elf Computer $106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

Before you buy another small computer, see if it includes the following features: ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Real cost of in warranty repairs; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5 S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Tiny Basic Cassette **$10.00,** on ROM **$38.00,** original Elf kit board **$14.95. 1802 software;** Moews Video Graphics **$3.50.** Games and Music **$3.00,** Chip 8 Interpreter **$5.50.**

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at $15.25 for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply).

Announcing Quest Super Basic— *SECOND GENERATION*

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range ±.17E^{38}), 32 b1t integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

Enhancements include increased speed, built-in provisions for Stringy Floppy, Floppy Disc, Printer Driver, I/O, user definable command library and statement renumbering.

Easily adaptable to most 1802 systems. Requires 16K RAM minimum for Basic and user programs. Source listing for both Serial and Parallel I/O included.

Super Basic on Cassette $40.00.

PROM Eraser
assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$69.50** (with timer **$94.50**).

Z80 Microcomputer
16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00. Tiny Basic $30.00**

S-100 Computer Boards

8K Static Godbout Econo IIA Kit	145.00
16K Static Godbout Econo XIV Kit	285.00
24K Static Godbout Econo VIIA-24 Kit	435.00
32K Static Godbout Econo X-32 Kit	575.00
16K Dynamic RAM KIt	199.00
32K Dynamic RAM Kit	310.00
64K Dynamic RAM Kit	470.00
Video Interface Kit	**$135.00**

80 IC Update Master Manual $55.00
Comp. IC data selector, 2700 pg. master reference guide. Over 51,000 cross references. Free update service through 1980. Domestic postage $3.50.

Modem Kit $60.00
State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included.

LRC 7000+Printer $389.00
40/20 column dot matrix impact, std. paper. Interface all personal computers.

64/40/32/20 version **$405.00.** Optional cables available.

LRC 7000 printer interface cable for Super Elf with software $26.00

NiCad Battery Fixer/Charger Kit
Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$7.25**

Rockwell AIM 65 Computer
6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display, ROM monitor, fully expandable. **$375.00.** 4K version **$450.00.** 4K Assembler **$85.00**, 8K Basic Interpreter **$100.00**.

Special small power supply for AIM65 assem. in frame **$54.00.** Complete AIM65 in thin briefcase with power supply **$499.00.** Molded plastic enclosure to fit both AIM65 and power supply **$47.50.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$599.00**

AIM65/KIM/VIM/Super Elf 44 pin expansion board; 3 female and 1 male bus. Board plus 3 connectors **$22.95.**

60 Hz Crystal Time Base Kit $4.40
Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $8.95
Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply
8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$29.95.** Kit with chassis and all hardware **$43.95.** Add $4.00 shipping. Kit of hardware **$14.00.** Woodgrain case **$10.00.** $1.50 shipping.

Gremlin Color Video Kit $69.95
32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. No high res. graphics. On board RF Modulator Kit **$4.95**

Elf II Adapter Kit $24.95
Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

1802 16K Dynamic RAM Kit $149.00
Expandable to 32K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$63.00**

Super Elf 44 pin expansion board; 3 female and 1 male bus. Board plus 3 connectors **$22.95**

Tiny Basic Extended on Cassette $15.00 (added commands include Stringy, Array, Cassette I/O etc.)

S-100 4-Slot Expansion $ 9.95

Super Monitor VI.I Source Listing $15.00

Super Color S-100 Video Kit $129.95
Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

Editor Assembler $25.00 (Requires minimum of 4K for E/A plus user source)

1802 Tiny Basic Source listing $19.00

Super Monitor V2.0/2.1 Source Listing $20.00

TERMS: $5.00 min. order U.S. Funds. Calif residents add 6% tax.
$10.00 min. order BankAmericard and Master Charge and COD. $1.00 insurance optional.
Shipping charges will be added on charge cards.

FREE: Send for your copy of our NEW 1980 QUEST CATALOG. Include 48¢ stamp.

apple II plus

With 48K of memory!

$1042.00

With the purchase of the APPLE II select from the below SPECIAL PRICING!

INTL OPTION Base$_2$ printer...	$599.00
Disk II W/cont....	585.00
Disk II.....	475.00
Ser. Printer Cd...	179.00
Sup'R'Mod.....	23.00
3way I/O Select..	33.00
Video 100 12"....	119.00
Firmware Card.	149.00
UHF to RCA Cable.	5.00



apple II/apple II plus

With 60K of memory!

$1259.00

- Switch from "APPLESOFT" to "INTEGER BASIC" and back again.
- With Disc Operating System DOS 3.3 run PASCAL program without need for a PASCAL card.

$159

BASE 2 PRINTER TO APPLE COMPUTER INTERFACE BOARD WITH CABLE

$124.95

apple clock/calendar

- Seconds, minutes, hours, day-of-week month, date, & year.
- On board batteries with one year life.
- Uses MSM5832 crystal controlled.

California Compuer Systems

S-100 MEMORY BOARD

16K STATIC RAM



$249.00 ASSEMBLED & TESTED

FULLY STATIC OPERATION
4K BANK ADDRESSABLE
EXTENDED MEMORY MGMT
MEETS IEEE PROPOSED S-100 SIGNAL STANDARDS
2 MHZ OPERATION

California Computer Systems

74LS00	.26
74LS02	.26
74LS03	.26
74LS04	.26
74LS08	.28
74LS09	.26
74LS10	.26
74LS20	.26
74LS21	.28
74LS22	.26
74LS26	.49
74LS27	.26
74LS30	.28
74LS32	.32
74LS38	.32
74LS42	.65
74LS48	.78
74LS51	.25
74LS54	.35
74LS74	.38
74LS75	.60
74LS83	.44
74LS85	.95
74LS86	.95
74LS90	.69
74LS93	.69
74LS107	.45
74LS112	.38
74LS113	.48
74LS122	.48
74LS123	.95
74LS126	.69
74LS138	.69
74LS151	.44
74LS153	.44
74LS155	1.15
74LS158	.75
74LS160	.95
74LS161	.85
74LS162	.95
74LS163	1.60
74LS164	.65
74LS165	.65
74LS170	1.75
74LS174	.75
74LS175	.75
74LS190	.75
74LS193	.95
74LS195	.95
74LS196	.85
74LS221	1.40
74LS240	1.65
74LS241	1.65
74LS243	1.45
74LS244	1.45
74LS245	2.25
74LS253	.95
74LS257	.95
74LS258	.95
74LS259	2.85
74LS279	.44
74LS283	1.00
74LS293	1.85
74LS298	1.20
74LS366	.95
74LS367	.55
74LS368	.55
74LS373	1.39
74LS374	1.39
74LS386	.65

Global Specialties

Logic Probes



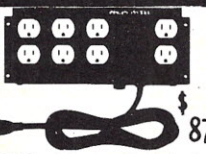
LP1 $37.49



LP2 $21.49



LP3 $58.49



$87.50

No "Glitches", Surges Or Interference

The MPD 117 is the low-cost solution to your power distribution problems. The MPD 117 has a high-performance EMI filter, built-in circuit breaker, two direct and six switched outlets, illuminated "on-off" switch for switched outlets, and is built with rugged UL-approved components and housing in an all-steel chassis with convenient mounting flanges.

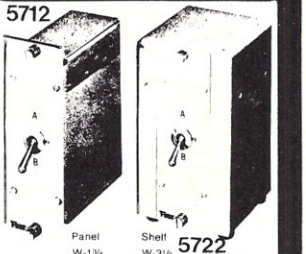
MSM5832

MICROPROCESSOR REAL-TIME CLOCK/CALENDAR $7.45

GENERAL DESCRIPTION

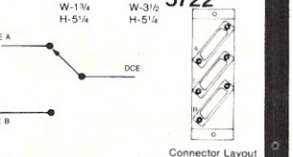
The MSM5832 is a monolithic, metal-gate CMOS integrated circuit that functions as a real time clock/calendar for use in bus-oriented microprocessor applications. The on-chip 32.768 Hz crystal controlled oscillator time base is counted down to provide addressable 4-bit I/O data of SECONDS, MINUTES, HOURS, DAY-OF-WEEK, DATE, MONTH, and YEAR. Data access is controlled by 4-bit address, chip select, read, write and hold inputs. Other functions include 12H/24H format selection, leap year identification and manual +30 second correction.

5712



Panel W-1¾ H-5¼

Shelf W-3½ H-5¼ 5722



Connector Layout

$145.00 $155.00

Description

The **RS-232C Compatible Digital Transfer Switch** is designed to switch modems between front end processors. All 24 pins of the connector are switched, with Pin 1 wired to ground.

T-bar INCORPORATED

EPROMS

2708	1K×8	$5.95	8 for $40
2716	2K×8	10.95	8 for $80
2732	4K×8	39.95	2 for $75

SINGLE 5 VOLT FOR 2716 & 2732

TRS 80

16K Memory Add On

$43.95

KIT CONTAINS DIP SWITCHES AND DETAILED INSTRUCTIONS

SN7400N	.20	SN7482N	1.05
SN7402N	.22	SN7492N	.50
SN7404N	.22	SN7493N	.48
SN7408N	.24	SN7495N	.60
SN7410N	.22	SN7496N	.70
SN7412N	.28	SN74122N	.39
SN7413N	.35	SN74136N	.95
SN7414N	.49	SN74141N	.69
SN7416N	.29	SN74151N	.65
SN7417N	.29	SN74153N	.65
SN7423N	.28	SN74154N	1.25
SN7425N	.25	SN74155N	.80
SN7430N	.23	SN74157N	.69
SN7437N	.29	SN74160N	.95
SN7438N	.24	SN74161N	.65
SN7440N	.22	SN74163N	.85
SN7442N	.57	SN74164N	.87
SN7443N	.78	SN74165N	.87
SN7445N	.78	SN74174N	.95
SN7451N	.20	SN74175N	.69
SN7454N	.20	SN74180N	.75
SN7474N	.32	SN74181N	1.15
SN7475N	.32	SN74393N	1.69

video 100



$125 Leedex Corp.

12" BLACK & WHITE LOW COST VIDEO MONITOR

MODEL 800B IMPACT PRINTER

- Dot resolution graphics in six densities
- 1920 character buffer
- Fully adjustable tractors to 9-1/2"

$649.00

base 2 inc.

TMS2716 E-PROM

REQUIRES THREE $8.50 POWER SUPPS.

APPLE EXPANSION KIT

16K Memory Add-On $39.00

MEMORY ADD-ON KIT INCLUDES INSTRUCTIONS

CONCORD COMPUTER COMPONENTS ✓297

1971 SOUTH STATE COLLEGE NAHEIM, CA. 92806

VISA MASTER CHARGE
CHECK OR M O
NO COD

(714) 937-0637

We stock and sell over 12,000 types of semiconductors

MINIMUM ORDER $10.00
ADD $1.50 FOR FRT
CAL RES ADD 6%

FRT. CHARGES

am't	frt. chg.
$10-49	$2.00
50-99	4.00
100-249	7.00
250-499	8.00
500-999	10.00
1000 up	inquire

VOLTAGE REGULATORS



NEGATIVE	POSITIVE
7905 .5V	7805 .5V
7908 .8V	7806 .6V
7915 .15V	7808 .8V
7918 .18V	7812 .12V

95¢

555 TIMER 27¢

MC1330A1P	$1.60
MC1350P	1.15
MC1358P	1.50
LM380N	1.75
NE565N	1.25
MC1458P	.50

S-100 16K ADD-ON BARE BOARD WITH DOCUMENTATION AND DETAILED INSTRUCTION BOOK

$28.95

8038C VCO Waveform Gen w/Sine $2.65

2114L

1024 x 4 Static RAM

300nsec $3.99
200nsec 4.75

SOROC TECHNOLOGY, INC.

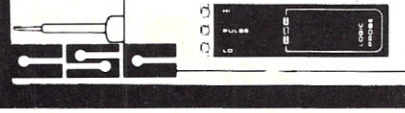
SCR's & Triacs

10 Amp, 400 Volts Isolated Tab TO-220 Pkg

IS410 95¢ IT410 95¢



IQ120 $689



$17.95 LOGIC PROBE KIT

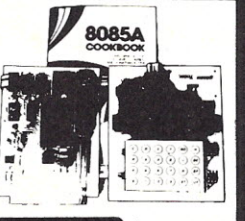
COMPLETE 8085A BASED

MICRO-COMPUTER

AND MICROPROCESSOR TRAINING UNIT

YOU GET:

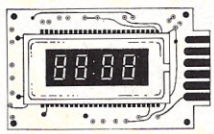
- *Fully assembled and tested 8085A Microcomputer with 1K RAM, 1K PROM, & 1K EPROM. Programmable I/O, Keyboard unit, CPU card, 20 ma Asynchronous serial port, Display and Operating system.*
- *8085A Cookbook. 362 pages takes you from basic concepts to actual design.*
- *8080/8085A Software Design Book I with detailed examination of all 244 instructions. 336 pages include sample programs using all basic instructions and typical assembly language.*



PACCOM $295.00

National Semiconductor Clock Modules

12VDC AUTOMOTIVE/ INSTRUMENT CLOCK



APPLICATIONS:
- In-dash autoclocks
- After-market auto/ RV clocks
- Aircraft-marine clks.
- 12VDC oper. instru.
- Portable/battery powered instrumnts.

Features: Bright 0.3" green display. Internal crystal time-base. ±0.5 sec./day accur. Auto. display brightness control logic. Display color filterable to blue, blue-green, green & yellow. Complete—just add switches and lens.

MA1003 Module $16.95

MA1023 .7" Low Cost Digital LED Clock Module	8.95
MA1026 .7" Dig. LED Alarm Clock/Thermometer	18.95
MA5036 .3" Low Cost Digital LED Clock/Timer	6.95
MA1002 .5" LED Display Dig. Clock & Xformer	9.95

National Semiconductor RAM SALE

MM5290N-4 (MK4116/UPD416) . . $4.95 each
16K DYNAMIC RAM (250NS)
(8 EACH $39.95) (100 EACH $450.00/lot)

MM5290J-2 (MK4116/UPD416) . . $6.95 each
16K DYNAMIC RAM (150NS)
(8 EACH $49.95) (100 EACH $550.00/lot)

MM5298J-3A ..... $3.25 each
8K DYNAMIC RAM (LOW HALF OF MM5290J) 200NS
(8 EACH $23.95) (100 EACH $250.00/lot)

MM2114-3 ..... $5.95 each
4K STATIC RAM (300NS)
(8 EACH $43.95) (100 EACH $450.00/lot)

MM2114L-3 ..... $6.25 each
4K STATIC RAM (LOW POWER 300NS)
(8 EACH $44.95) (100 EACH $475.00/lot)

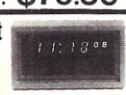
EPROM Erasing Lamp



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

UVS-11E $79.50

Jumbo 6-Digit Clock Kit



- Four .630"ht. and two .300"ht. common anode displays
- Uses MM5314 clock chip
- Switches for hours, minutes and hold functions
- Hours easily viewable to 30 feet
- Simulated walnut case
- 115VAC operation
- 12 or 24 hour operation
- Includes all components, case and wall transformer
- Size: 6¾" x 3-1/8" x 1¾"

JE747 ..... $29.95

6-Digit Clock Kit



- Bright .300 ht. comm. cathode display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold modes
- Hrs. easily viewable to 20 ft.
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hr. operation
- Incl. all components, case & wall transformer
- Size: 6¾" x 3-1/8" x 1¾"

JE701 ..... $19.95

Regulated Power Supply



Uses LM309K. Heat sink provided. PC board construction. Provides a solid 1 amp @ 5 volts. Can supply up to ±5V, ±9V and ±12V with JE205 Adapter. Includes components, hardware and instructions. Size: 3½" x 5" x 2"H

JE200 ..... $14.95



ADAPTER BOARD —Adapts to JE200— ±5V, ±9V and ±12V

DC/DC converter with +5V input. Toriodal hi-speed switching XFMR. Short circuit protection. PC board construction. Piggy-back to JE 200 board. Size: 3½" x 2" x 9/16"H

JE205 ..... $12.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS8080A	CPU	6.50
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.95
DP8238	System Controller	5.95
INS8243	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.95
DP8251	Prog. Comm. I/O (USART)	7.95
DP8253	Prog. Interval Timer	14.95
DP8255	Prog. Peripheral I/O (PPI)	9.95
DP8257	Prog. DMA Control	19.95
DP8259	Prog. Interrupt Control	14.95
DP8275	Prog. CRT Controller	49.95
DP8279	Prog. Keyboard/Display Interface	19.95
DP8300	Octal Bus Receiver	6.95
DP8303	System Timing Element	6.95
DP8304	8-Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	3.95
DP8308	8-Bit Bi-Directional Receiver	3.95

6800/6800 SUPPORT DEVICES

MC6800	MPU	14.95
MC6802CP	MPU with Clock and RAM	19.95
MC6810API	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	10.95
MC6830L8	1024x8-Bit ROM (MC68A30-8)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	0-600bps Digital MODEM	10.95
MC6862	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus. Trans. (MC8T26)	2.25

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (2MHz)	13.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	15.95
CDP1802	CPU	19.95
2650	MPU	16.95
IDM2901 ADC	CPU—4-Bit Slice (Com. Temp. Grade)	19.95
MC6502	MPU w/Clock (65K Bytes Memory)	11.95
INS8035N-6	MPU—8-Bit (6MHz)	16.95
INS8039N-6	CPU—Sgl. Chip 8-Bit (128 bytes RAM)	19.95
INS8040N-6	CPU (256 Bytes RAM)	24.95
INS8070N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
P8085	CPU	19.95
INS8900	CPU—16-Bit	29.95
TMS9900JL	MPU—16-Bit	49.95

SHIFT REGISTERS

MM500H	Dual 25-Bit Dynamic	.50
MM503H	Dual 50-Bit Dynamic	.50
MM506H	Dual 100-Bit Static	.50
MM510H	Dual 64-Bit Accumulator	.50
MM1402	256-Bit Dynamic	3.95
MM5013	1024-Bit Dynamic/Accumulator	1.95
MM5016H	500/512-Bit Dynamic	.89
MM5034N	Octal 80-Bit	9.95
MM5035N	Octal 80-Bit	9.95
2504V (1404A)	1024-Bit Dynamic	3.95
2518N	Hex 32-Bit Static	4.95
2522V	Dual 132-Bit Static	2.95
2524V	512-Bit Dynamic	.99
2525V	1024-Bit Dynamic	2.95
2527V	Dual 256-Bit Static	2.95
2528V	Dual 250-Bit Static	4.00
2529V	Dual 240-Bit Static	4.00
2532N	Quad 80-Bit Static	2.95
3341PC	Fifo (Dual 80)	6.95

DATA ACQUISITION

AF100-1CN	Universal Active Filter 2.5%	5.95
AF122-1CJ	Touch Tone Low Pass Filter	19.95
AF123-1CJ	Touch Tone Low Pass Filter	19.95
LM308AH	Super Gain Op Amp	1.00
LM334Z	Constant Current Source	1.30
LM335Z	Temperature Transducer	1.40
LF356N	JFET Input Op Amp	1.10
LF398N	Sample & Hold Amplifiers	3.95
LM399H	Temp. Comp. Prec. Ref. (.5ppm/C°)	4.95
ADC0804LCN	8-Bit A/D Converter (1 LSB)	4.95
DAC0806LCN	8-Bit D/A Converter (0.78% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0817CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1000LCN	10-Bit D/A Conv. Micro. Comp. (0.05%)	13.95
DAC1008LCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	8.95
DAC1020LCN	10-Bit D/A Converter (0.05% Lin.)	8.45
DAC1022LCN	10-Bit D/A Converter (0.20% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.20% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.19
AY-5-1013	30K BAUD UART	5.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	.99
2101 (8101)	256x4 Static	3.95
2102	1024x1 Static	1.75
2L02	1024x1 Static	1.95
2111 (8111)	256x4 Static	3.95
2112	256x4 Static MOS	4.95
2114	1024x4 Static 450ns	5.95
2114L	1024x4 Static 450ns Low Power	6.95
2114-3	1024x4 Static 300ns	7.49
2114L-3	1024x4 Static 300ns Low Power	7.95
2117	16,384x1 Dynamic 550ns (house marked)	4.95
4116 (UPD416)	16K Dynamic 250ns	4.95
MM2147J	4096x1 Fast 70ns	19.95
5101	256x4 Static	7.95
MM5261	1024x1 Dynamic Fully Decoded	.99
MM5262	2Kx1 Dynamic	.25
MM5280/2107	4096x1 Dynamic	4.95
MM5290J-2(4116)	16K Dynamic 150ns (UPD416)	6.95
MM5298J-3A	8K Dyn. 200ns (lower ½ of MM5290J)	4.95
7489	16x4 Static	1.75
UPD414/MK4027	4K Dynamic 16-pin	4.95
TMS4044-45NL	4K Static	14.95
TMS4045	1024x4 Static	14.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	9.95
TMS2716	16K EPROM (-5V, +5V, +12V)	19.95
2716 Intel(2516) TI	16K EPROM (Single +5V)	17.95
2732 Intel(2532) TI	32K EPROM	49.95
2758	8K EPROM (450ns) (Single +5V)	7.95
5203	2048 PROM	14.95
82S23(74S188)	32x8 PROM (Open Collector)	4.95
82S115	4096 Bipolar PROM	19.95
82S123(74S288)	32x8 Tri-State Bipolar PROM	4.95
82S185	8K PROM	29.95

ROM'S

2513(2140)	Character Generator (Upper Case)	9.95
2513(3021)	Character Generator (Lower Case)	9.95
2516N	Character Generator	10.95
MM5230N	2048-Bit Read Only Memory	1.95

NMOS READ ONLY MEMORIES

MCM66710P	128x9x7 ASCII Shifted w/Greek	13.50
MCM66740P	128x9x7 Math Symbol & Pictures	13.50
MCM66750P	128x9x7 Alpha, Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

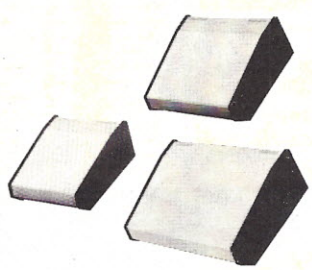
SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (5MZ)	3.50
DS0026CN	Dual MOS Clock Driver (5MZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM58167N	Microprocessor Real Time Clock	8.95
MM58174N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg.VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

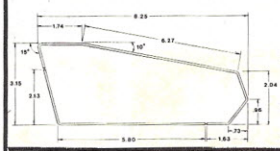
AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9500	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (16 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53190N	Push Button Pulse Dialer	7.95
MM57499N	96/144-Key Serial Keyboard Encoder	8.95

DESIGNERS' SERIES
Blank Desk-Top Electronic Enclosures



- High strength epoxy molded end pieces in mocha brown finish.
- Sliding rear/bottom panel for service and component accessibility.
- Top / bottom panels .080 thk alum. Alodine type 1200 finish (gold tint color) for best paint adhesion after modification.
- Vented top and bottom panels for cooling efficiency.
- Rigid construction provides unlimited applications.

CONSTRUCTION:
The "DTE" Blank Desk Top Electronic Enclosures are designed to blend and complement today's modern computer equipment and can be used in both industrial and home. The end pieces are precision molded with an internal slot (all around) to accept both top and bottom panels. The panels are then fastened to ¼" thick tabs inside the end pieces to provide maximum rigidity to the enclosure. For ease of equipment servicing, the rear/ bottom panel slides back on slotted tracks while the rest of the enclosure remains intact. Different panel widths may be used while maintaining a common profile outline. The molded end pieces can also be painted to match any panel color scheme.



Enclosure Model No.	Panel Width	PRICE
DTE-8	8.00"	$29.95
DTE-11	10.65"	$32.95
DTE-14	14.00"	$34.95

$10.00 Min. Order — U.S. Funds Only
Calif. Residents Add 6% Sales Tax
Postage—Add 5% plus $1 Insurance

✓41

Spec Sheets — 25¢
Send 41¢ Postage for your FREE 1981 JAMECO CATALOG

NEW 1981 CATALOG

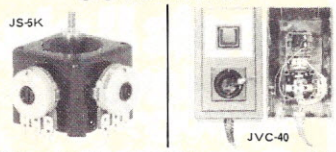
Jameco ELECTRONICS

PHONE ORDERS WELCOME (415) 592-8097

MAIL ORDER ELECTRONICS — WORLDWIDE
1355 SHOREWAY ROAD, BELMONT, CA 94002
PRICES SUBJECT TO CHANGE

1/81

JOYSTICKS



JS-5K	5K Linear Taper Pots	$5.25
JS-100K	100K Linear Taper Pots	$4.95
JVC-40	40K (2) Video Controller in case	$5.95

AC and DC Wall Transformers



Ideal for use with clocks, games, power supplies or any other type of AC or DC application.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12 VAC 250mA	$3.95
AC 500	117V/60Hz	12 VAC 500mA	$4.95
AC1000	117V/60Hz	12 VAC 1 amp	$5.95
DV9200	117V/60Hz	9 VDC 200mA	$3.25
DC 900	120V/60Hz	9 VDC 500mA	$3.95

CONNECTORS



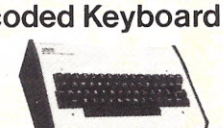
DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

TRS-80
16K Conversion Kit

Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
★8 ea. MM5290 (UPD416/4116) 16K Dyn. Rams (*NS)
★Documentation for Conversion

TRS-16K2 *150NS $49.95
TRS-16K4 *250NS $39.95

JE610 ASCII
Encoded Keyboard Kit

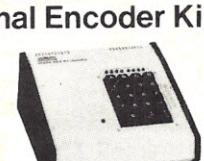


The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and —12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14½"W x 8¾"D

JE610/DTE-AK	(as pictured above)	$124.95
JE610 Kit	62-Key Keyboard, PC Board, & Components (no case)	$ 79.95
K62	62-Key Keyboard (Keyboard only)	$ 34.95
DTE-AK	(case only — 3¾"Hx11"Wx8¾"D)	$ 49.95

JE600
Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¼"W x 8¾"D

JE600/DTE-HK	(as pictured above)	$99.95
JE600 Kit	19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case)	$59.95
K19	19-Key Keyboard (Keyboard only)	$14.95
DTE-HK	(case only — 3½"Hx8¾"Wx8¾"D)	$44.95

7400

SN7400N	.25			SN74156N	.79
SN7401N	.20			SN74157N	.69
SN7402N	.25	SN7472N	.29	SN74160N	.89
SN7403N	.25	SN7473N	.35	SN74161N	.89
SN7404N	.25	SN7474N	.35	SN74162N	.89
SN7405N	.29	SN7475N	.49	SN74163N	.89
SN7406N	.35	SN7476N	.35	SN74164N	.89
SN7407N	.35	SN7479N	5.00	SN74165N	.89
SN7408N	.29	SN7480N	.50	SN74166N	1.25
SN7409N	.29	SN7482N	.99	SN74167N	2.79
SN7410N	.25	SN7483N	.69	SN74170N	1.95
SN7411N	.29	SN7485N	.89	SN74172N	4.95
SN7412N	.35	SN7486N	.35	SN74173N	1.39
SN7413N	.40	SN7489N	1.75	SN74174N	.99
SN7414N	.69	SN7490N	.49	SN74175N	.89
SN7416N	.29	SN7491N	.59	SN74176N	.79
SN7417N	.29	SN7492N	.45	SN74177N	.79
SN7420N	.25	SN7493N	.45	SN74179N	1.49
SN7421N	.29	SN7494N	.69	SN74180N	.79
SN7422N	.45	SN7495N	.69	SN74181N	2.25
SN7423N	.29	SN7496N	.69	SN74182N	.79
SN7425N	.29	SN7497N	3.00	SN74184N	2.49
SN7426N	.29	SN74100N	1.49	SN74185N	2.49
SN7427N	.25	SN74107N	.35	SN74190N	1.25
SN7429N	.39	SN74109N	.39	SN74191N	1.25
SN7430N	.25	SN74116N	1.95	SN74192N	.89
SN7432N	.29	SN74121N	.39	SN74193N	.89
SN7437N	.25	SN74122N	.55	SN74194N	.89
SN7438N	.40	SN74123N	.59	SN74195N	.69
SN7439N	.25	SN74125N	.49	SN74196N	.89
SN7440N	.20	SN74126N	.49	SN74197N	.89
SN7441N	.89	SN74132N	.75	SN74198N	1.49
SN7442N	.59	SN74136N	.75	SN74199N	1.49
SN7443N	1.10	SN74141N	.99	SN74221N	1.25
SN7444N	1.10	SN74142N	3.25	SN74251N	.99
SN7445N	.89	SN74143N	3.49	SN74276N	1.95
SN7446N	.79	SN74144N	3.49	SN74279N	.79
SN7447N	.69	SN74145N	.79	SN74283N	1.49
SN7448N	.79	SN74147N	1.95	SN74284N	3.95
SN7450N	.20	SN74148N	1.29	SN74285N	3.95
SN7451N	.20	SN74150N	1.25	SN74365N	.69
SN7453N	.20	SN74151N	.69	SN74366N	.69
SN7454N	.20	SN74152N	.69	SN74367N	.69
SN7459A	.25	SN74153N	.79	SN74368N	.69
SN7460N	.20	SN74154N	1.25	SN74390N	1.49
SN7470N	.29	SN74155N	.79	SN74393N	1.49

74LS

74LS00	.29			74LS192	1.15
74LS01	.29			74LS193	1.15
74LS02	.29	74LS92	.75	74LS194	1.15
74LS03	.29	74LS93	.75	74LS195	1.15
74LS04	.35	74LS95	.99	74LS197	1.19
74LS05	.35	74LS96	1.15	74LS221	1.19
74LS08	.29	74LS107	.45	74LS240	1.95
74LS09	.35	74LS109	.45	74LS241	1.95
74LS10	.29	74LS112	.45	74LS242	1.95
74LS11	.75	74LS113	.49	74LS243	1.95
74LS12	.35	74LS114	.49	74LS244	1.95
74LS13	.59	74LS122	.89	74LS245	2.95
74LS14	.99	74LS123	1.25	74LS247	1.19
74LS15	.35	74LS125	.89	74LS248	1.19
74LS20	.29	74LS126	.55	74LS249	1.19
74LS21	.35	74LS132	.99	74LS251	1.49
74LS22	.35	74LS133	.89	74LS253	.99
74LS26	.35	74LS136	.49	74LS257	.89
74LS27	.35	74LS138	.89	74LS258	.99
74LS28	.35	74LS139	.89	74LS260	.69
74LS30	.29	74LS151	.89	74LS266	.69
74LS32	.35	74LS153	.89	74LS273	1.95
74LS33	.59	74LS154	1.75	74LS279	.75
74LS37	.45	74LS155	1.19	74LS283	1.09
74LS38	.49	74LS156	1.19	74LS290	.99
74LS40	.35	74LS157	.89	74LS293	.99
74LS42	.89	74LS158	.99	74LS298	1.25
74LS47	.89	74LS160	1.15	74LS352	1.29
74LS48	1.15	74LS161	1.15	74LS353	1.29
74LS49	1.15	74LS162	1.15	74LS365	.75
74LS51	.29	74LS163	1.15	74LS366	.75
74LS54	.29	74LS164	1.25	74LS367	.75
74LS55	.29	74LS165	1.25	74LS368	.75
74LS73	.45	74LS168	1.19	74LS373	1.95
74LS74	.45	74LS169	1.19	74LS374	1.95
74LS75	.59	74LS170	2.49	74LS375	.89
74LS76	.45	74LS173	1.39	74LS386	.69
74LS78	.49	74LS174	.99	74LS393	2.49
74LS83	.89	74LS175	.99	74LS399	2.49
74LS85	1.25	74LS181	2.95	74LS670	2.49
74LS86	.45	74LS190	1.25	81LS95	1.95
74LS90	.59	74LS191	1.25	81LS97	1.95

74S

74S00	.50			74S244	3.25
74S02	.50			74S251	1.45
74S03	.50	74S133	.55	74S253	1.45
74S04	.55	74S134	.69	74S257	1.35
74S05	.55	74S135	1.19	74S258	1.35
74S08	.50	74S136	1.75	74S260	.79
74S09	.50	74S138	1.35	74S280	2.95
74S10	.50	74S139	1.35	74S287*	4.95
74S11	.50	74S140	1.15	74S288*	4.95
74S15	.50	74S151	1.35	74S373	3.49
74S20	.50	74S153	1.35	74S374	3.49
74S22	.50	74S157	1.35	74S387*	5.95
74S30	.50	74S158	1.35	74S471*	19.95
74S32	.55	74S174	1.59	74S472*	19.95
74S40	.55	74S175	1.59	74S473*	19.95
74S51	.50	74S188	4.95	74S474*	21.95
74S64	.50	74S194	1.95	74S475*	21.95
74S65	.50	74S195	1.95	74S570*	7.95
74S74	.79	74S196	3.95	74S571*	7.95
74S86	.79	74S240	2.95	74S572*	19.95
74S112	.79	74S241	2.95	74S573*	19.95
74S113	.79	74S242	3.25	74S940	3.15
74S114	.79	74S243	3.25	74S941	3.15

* LIMITED AVAILABILITY ON THESE PROMS

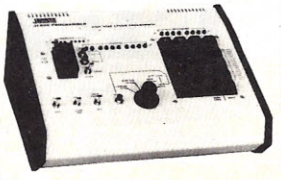
CA–LINEAR

CA3013H	2.15			CA3089N	3.75
CA3023H	3.25			CA3096N	3.95
CA3039H	1.35			CA3130H	1.39
CA3046N	1.30	CA3081N	2.00	CA3140H	1.25
CA3059N	3.25	CA3082N	2.00	CA3160H	1.25
CA3060N	3.25	CA3083N	1.60	CA3401N	.59
CA3080H	1.25	CA3086N	.85	CA3600N	3.50

CD–CMOS

CD4000	.39			CD4082	.39
CD4001	.39			CD4093	.99
CD4002	.39			CD4098	2.49
CD4006	1.19			CD4506	.75
CD4007	.25	CD4041	1.49	CD4507	.99
CD4009	.49	CD4042	.99	CD4508	3.95
CD4010	.49	CD4043	.89	CD4510	1.39
CD4011	.39	CD4044	.89	CD4511	1.29
CD4012	.25	CD4046	1.79	CD4514	3.95
CD4013	.49	CD4047	2.50	CD4515	2.95
CD4014	1.39	CD4048	1.35	CD4516	1.49
CD4015	1.19	CD4049	.49	CD4518	1.79
CD4016	.69	CD4050	.69	CD4519	.89
CD4017	1.19	CD4051	1.19	CD4520	1.29
CD4018	.99	CD4052	1.19	CD4526	1.79
CD4019	.49	CD4053	1.19	CD4528	1.79
CD4020	1.19	CD4056	2.95	CD4529	1.95
CD4021	1.39	CD4059	9.95	CD4543	2.79
CD4022	1.19	CD4060	1.49	CD4562	11.95
CD4023	.29	CD4066	.79	CD4566	2.79
CD4024	.79	CD4068	.39	CD4583	2.49
CD4025	.23	CD4069	.45	CD4723	1.95
CD4026	2.95	CD4070	.55	CD4724	1.95
CD4027	.69	CD4071	.49	MC14409	14.95
CD4028	.89	CD4072	.49	MC14410	14.95
CD4029	1.49	CD4073	.39	MC14411	14.95
CD4030	.49	CD4075	.39	MC14412	11.95
CD4035	.99	CD4076	1.39	MC14419	4.95
CD4040	1.49	CD4081	.39	MC14433	13.95

JE608 PROGRAMMER
2708 EPROM PROGRAMMER



- 3 separate Display Registers: 8 LED's for Hex Key entries, 10 LED's (2^0–2^9) for Address Register and 8 LED's for Data Memory Register. The Data Memory Register displays the content of the RAMs from the EPROM Chip.
- Development of microprocessor systems by means of a ribbon cable from the programmer panel test socket to the EPROM socket on the microprocessor board.
- Rapid checking verification of programmed data changes.
- User may move data from a master to RAM's or write into RAM's with keyboard entries.
- Allows manual stepping manipulation (up and down) at any address location.
- Stand-alone EPROM Programmer consisting of:
  A 19-key Hexadecimal Keyboard assembly, Programmer Board assembly with 6 power supplies and a LED/Test Socket Panel Board assembly. The Test Socket is zero force insertion type. Power requirements: 115VAC, 60Hz, 9W.
- Compact desk-top enclosure: Color-coordinated designer's case with light tan panels and molded end pieces in mocha brown. Size: 3¼"H x 11"W x 8¾"D. Weight: 5 lbs.

The **JE608 EPROM Programmer** is a completely self-contained unit which is independent of computer control and requires no additional systems for its operations. The EPROM can be programmed from the Hexadecimal Keyboard or from a pre-programmed EPROM. The JE608 Programmer can emulate a programmed EPROM by the use of its internal RAM circuits. This will allow the user to test or pretest a program, for a system, prior to programming a chip. Any changes in the program can be entered directly into the memory circuits with the Hexadecimal Keyboard so that rewriting the entire program will not be necessary. The JE608 Programmer contains a Programmer/Board with 25 IC's and including power supplies of: –5V, +5V, +12V and +26V. The Hexadecimal Keyboard and LED/Test Socket Panel Board are separate assemblies within the system.

JE608K KIT **$399.95**
JE608A Assembled and tested **$499.95**

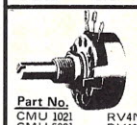
DISCRETE LEDS

XC556R	.200"	red	5/$1	MV50	.085"	red	6/$1	XC111R	.190"	red	5/$1
XC556G	.200"	green	4/$1	XC209R	.125"	red	5/$1	XC111G	.190"	green	4/$1
XC556Y	.200"	yellow	4/$1	XC209G	.125"	green	4/$1	XC111Y	.190"	yellow	4/$1
XC556C	.200"	clear	4/$1	XC209Y	.125"	yellow	4/$1	XC111C	.190"	clear	4/$1
XC22R	.200"	red	5/$1	XC526R	.185"	red	5/$1				
XC22G	.200"	green	4/$1	XC526G	.185"	green	4/$1	INFRA-RED LED			
XC22Y	.200"	yellow	4/$1	XC526Y	.185"	yellow	4/$1	¼"x ¼"x 1/16" flat			
MV10B	.170"	red	4/$1	XC526C	.185"	clear	4/$1	IRL — 5/$1			

DISPLAY LEDS

C.A. — Common Anode				C.C. — Common Cathode			
Type	Polarity	Ht	Price	Type	Polarity	Ht	Price
MAN 1	C.A.—red	.270	2.95	DL741	C.A.—red	.600	1.25
MAN 2	5x7 D.M.—red	.300	4.95	DL746	C.A.—red ± 1	.630	1.49
MAN 3	C.C.—red	.125	.25	DL747	C.A.—red	.600	1.49
MAN 52	C.A.—green	.300	1.25	DL750	C.C.—red	.600	1.49
MAN 54	C.C.—green	.300	1.25	DL33B	C.C.—red	.110	.35
MAN 71	C.A.—red	.300	.75	FND358	C.C. ± 1	.357	.99
MAN 72	C.A.—red	.300	.75	FND359	C.C.	.357	.75
MAN 74	C.C.—red	.300	1.25	FND503	C.C. (FND500)	.500	.99
MAN 82	C.A.—yellow	.300	.49	FND507	C.A. (FND510)	.500	.99
MAN 84	C.C.—yellow	.300	.99	HDSP-3401	C.A.—red	.800	1.50
MAN 3620	C.A.—orange	.300	.49	HDSP-3403	C.C.—red	.800	1.50
MAN 3630	C.A.—orange ± 1	.300	.99	5082-7613	C.C.,R.H.D.—red	.300	1.25
MAN 3640	C.C.—orange	.300	.99	5082-7620	C.A.,L.H.D.—yel.	.300	1.25
MAN 4610	C.A.—orange	.400	.99	5082-7623	C.C.,R.H.D.—yel.	.300	1.25
MAN 6610	C.A.—orange—DD	.560	.99	5082-7730	C.A.,L.H.D.—red	.300	.99
MAN 6630	C.A.—orange ± 1	.560	.99	5082-7731	C.A.,R.H.D.—red	.300	1.25
MAN 6640	C.C.—orange—DD	.560	.99	5082-7750	C.A.,L.H.D.—red	.430	1.75
MAN 6650	C.C.—orange ± 1	.560	.99	5082-7751	C.A.,R.H.D.—red	.430	1.25
MAN 6660	C.A.—orange	.560	.99	5082-7760	C.C.,R.H.D.—red	.430	1.75
MAN 6710	C.A.—red—DD	.560	.99	5082-7300	4x7 sgl. dig. RHD	.600	22.00
MAN 6750	C.C.—red ± 1	.560	.99	5082-7302	4x7 sgl. dig. LHD	.600	22.00
MAN 6780	C.C.—red	.560	.99	5082-7304	Overnge. char. (±1)	.600	19.95
DL704	C.C.—red	.300	1.25	4N28	Photo Xsistor Opto-Isol.		.99
DL707	C.A.—red	.300	1.25	LIT-1	Photo Xsistor Opto-Isol.		.69
DL728	C.C.—red	.500	1.49	MOC3010	Optically Isol.Triac Driver		1.25

POTENTIOMETERS



$2.95 each
2 Watt @ 70°C ± 10%
7/8" Slotted Shaft
Linear Taper
Meets Mil-R-94

Part No.		
CMU 1021	RV4NAY SD - 102A	1K
CMU 5021	RV4NAY SD - 502A	5K
CMU 1031	RV4NAY SD - 103A	10K
CMU 2531	RV4NAY SD - 253A	25K
CMU 5031	RV4NAY SD - 503A	50K
CMU 1041	RV4NAY SD - 104A	100K
CMU 1052	RV4NAY SD - 105A	1Meg



$1.35 each
3/4 Watt @ 70°C
15 turn pot. Linear taper. Printed circuit mount.

Part No.	Part No.	Part No.
830P- 50ohm	830P- 5K	830P-100K
830P-100ohm	830P-10K	830P-200K
830P-500ohm	830P-20K	830P-500K
830P-1K	830P-50K	830P-1Meg
830P-2K		

LOW PROFILE (TIN) SOCKETS



	1-24	25-49	50-100
8 pin LP	.17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL STANDARD (TIN)



	1-24	25-49	50-100
14 pin ST	.27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	.99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

SOLDERTAIL (GOLD) STANDARD



	1-24	25-49	50-100
8 pin SG	.39	.35	.31
14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3



	1-24	25-49	50-100
8 pin WW	.59	.54	.49
10 pin WW	.69	.63	.58
14 pin WW	.79	.73	.67
16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
20 pin WW	1.19	1.08	.99
22 pin WW	1.49	1.35	1.23
24 pin WW	1.39	1.26	1.14
28 pin WW	1.69	1.53	1.38
36 pin WW	2.19	1.99	1.79
40 pin WW	2.29	2.09	1.89

1/4 WATT RESISTOR ASSORTMENTS – 5%

ASST. 1	5ea.	10 Ohm 12 Ohm 15 Ohm 18 Ohm 22 Ohm 27 Ohm 33 Ohm 39 Ohm 47 Ohm 56 Ohm	50pcs.	$1.95
ASST. 2	5ea.	68 Ohm 82 Ohm 100 Ohm 120 Ohm 150 Ohm 180 Ohm 220 Ohm 270 Ohm 330 Ohm 390 Ohm	50pcs.	$1.95
ASST. 3	5ea.	470 Ohm 560 Ohm 680 Ohm 820 Ohm 1K 1.2K 1.5K 1.8K 2.2K 2.7K	50pcs.	$1.95
ASST. 4	5ea.	3.3K 3.9K 4.7K 5.6K 6.8K 8.2K 10K 12K 15K 18K	50pcs.	$1.95
ASST. 5	5ea.	22K 27K 33K 39K 47K 56K 68K 82K 100K 120K	50pcs.	$1.95
ASST. 6	5ea.	150K 180K 220K 270K 330K 390K 470K 560K 680K 820K	50pcs.	$1.95
ASST. 7	5ea.	1M 1.2M 1.5M 1.8M 2.2M 2.7M 3.3M 3.9M 4.7M 5.6M	50pcs.	$1.95
ASST. 8R		Includes Resistor Assts. 1-7 (350 pcs.)		$10.95 ea.

$10.00 Min. Order — U.S. Funds Only
Calif. Residents Add 6% Sales Tax
Postage — Add 5% plus $1 Insurance

✓ 41

Spec Sheets — 25¢
Send 41¢ Postage for your FREE 1981 JAMECO CATALOG

NEW 1981 CATALOG

Jameco ELECTRONICS

PHONE ORDERS WELCOME
(415) 592-8097

MAIL ORDER ELECTRONICS — WORLDWIDE
1355 SHOREWAY ROAD, BELMONT, CA 94002
PRICES SUBJECT TO CHANGE

1/81

INTERSIL

Part No.	Function	Price
7045IPI	CMOS Precision Timer	14.95
7045EV/Kit*	Stopwatch Chip, XTL	22.95
7106CPL	3½ Digit A/D (LCD Drive)	16.95
7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3½ Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	28.95
7116CPL	3½ Digit A/D LCD Dis. HLD.	18.95
7117CPL	3½ Digit A/D LED Dis. HLD.	17.95
7201IDR	Low Battery Volt Indicator	2.25
7205IPG	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	Stopwatch Chip, XTL	19.95
7206CJPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	9.95
7207AIPD	Oscillator Controller	6.50
7207AEV/Kit*	Freq. Counter Chip, XTL	11.10
7208IPI	Seven Decade Counter	17.95
7209IPA	Clock Generator	3.95
7215IPG	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	4 Func. Stopwatch Chip, XTL	19.95
7216AIJI	8-Digit Univ. Counter C.A.	32.00
7216CIJI	8-Digit Freq. Counter C.A.	26.95
7216DIPI	8-Digit Freq. Counter C.C.	21.95
7217IJI	4-Digit LED Up/Down Counter	12.95
7218CIJI	8-Digit Univ. LED Drive	10.95
7224IPL	LCD 4½ Digit Up Counter DRI	11.25
7226AIJL	8-Digit Univ. Counter	31.95
7226AEV/Kit*	5 Function Counter Chip, XTL	74.95
7240IJE	CMOS Bin Prog. Timer/Counter	4.95
7242IJA	CMOS Divide-by-256 RC Timer	2.05
7250IJE	CMOS BCD Prog. Timer/Counter	6.00
7260IJE	CMOS BCD Prog. Timer/Counter	5.25
7555IPA	CMOS 555 Timer (8 pin)	1.45
7556IPD	CMOS 556 Timer (14 pin)	2.20
7611BCPA	CMOS Op Amp Comparator 5MV	2.25
7612BCPA	CMOS Op Amp Ext. Cmvr. 5MV	2.95
7621BCPA	CMOS Dual Op Amp Comp. 5MV	3.95
7631CCPE	CMOS Tri Op Amp Comp. 10MV	5.35
7641CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7642CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7660CPA	Voltage Converter	2.95
8069CCQ	50ppm Band—GAP Volt Ref. Diode	2.50
8211CPA	Volt Ref/Indicator	2.50
8212CPA	Volt Ref/Indicator	2.50

* INTERSIL'S EVALUATION KITS

74C

74C00	.39			74C195	1.59
74C02	.39			74C221	1.95
74C04	.39			74C240	2.25
74C08	.39	74C106	.75	74C244	2.25
74C10	.39	74C107	1.89	74C373	2.49
74C14	.75	74C151	2.95	74C374	2.59
74C20	.39	74C154	3.95	74C901	.89
74C30	.39	74C157	2.25	74C903	1.15
74C42	1.39	74C160	1.69	74C911	10.95
74C48	1.95	74C161	1.60	74C912	10.95
74C73	.79	74C162	1.49	74C915	1.69
74C74	.79	74C163	1.69	74C917	10.95
74C85	1.95	74C164	1.59	74C922	5.49
74C86	.99	74C173	1.39	74C923	5.75
74C89	6.95	74C174	1.39	74C925	7.50
74C90	1.29	74C175	1.39	74C926	7.50
74C93	1.29	74C192	1.69	80C95	.79
74C95	1.59	74C193	1.69	80C97	.79

LINEAR

LH0002CN	6.85			NE570N	4.95
LM10CLH	4.50			LM702H	.79
LM11CLH	4.75			LM703CN	.89
LH0070-OH	6.05	LM340T-5	1.25	LM709N	.29
TL071CP	.79	LM340T-12	1.25	LM710N	.79
TL072CP	1.39	LM340T-15	1.25	LM711N	.79
TL074CN	2.49	LM341P-5	.75	LM723N	.69
LH0082CD	35.80	LM341P-12	.75	LM733N	1.00
TL082CP	1.19	LM341P-15	.75	LM739N	1.19
TL084CN	2.19	LM342P-5	.69	LM741CN	.35
LH0094CD	36.80	LM342P-12	.69	MC1741SCG	3.00
LM300H	.99	LM342P-15	.69	LM747N	.79
LM301CN	.35	LM348N	1.25	LM748N	.59
LM302H	1.95	LM350K	5.75	LM1014N	2.75
LM304H	1.95	LF351N	.60	LM1310N	1.95
LM305H	.99	LF353N	1.00	LM1458CN	.59
LM307CN	.45	LF355N	1.10	LM1488N	1.25
LM308CN	1.00	LF356N	1.10	LM1489N	1.25
LM309H	1.95	LM358N	1.00	LM1496N	1.95
LM309K	1.25	LM359N	1.79	LM1556V	1.75
LM310CN	1.75	LM370N	4.49	LM1800N	2.95
LM311H	.90	LM373N	3.25	LM1877N-9	3.25
LM312H	2.49	LM377N	2.95	LM1889N	3.20
LM317MP	1.15	LM380N	1.25	LM1896N	1.75
LM317T	1.75	LM381N	1.95	LM2002T	1.49
LM317K	3.95	LM382N	1.79	LM2877P	2.05
LM318CN	1.95	LM384N	1.95	LM2878P	2.25
LM319N	1.95	LM386N-3	1.29	LM2896P-1	2.25
LM320K-5	1.35	LM387N	1.45	LM3189N	2.95
LM320K-12	1.35	LM389N	1.35	LM3900N	.69
LM320K-15	1.35	LM392N	.69	LM3905CN	1.25
LM320T-5	1.25	LF398N	4.00	LM3909N	1.15
LM320T-12	1.25	LM399H	5.00	LM3914N	3.95
LM320T-15	1.25	TL494CN	4.49	LM3915N	3.95
LM323K-5	5.95	TL496CP	1.75	LM3916N	3.95
LM324N	.99	NE510A	6.00	RC4136N	1.25
LM329DZ	.65	NE529A	4.95	RC4151NB	3.95
LM331N	3.95	NE531H	3.95	RC4194TK	5.95
LM334Z	1.30	NE536H	6.00	RC4195TK	5.49
LM335Z	1.40	NE540H	6.00	KB4428	4.25
LM336Z	1.75	NE544N	4.95	KB4429	5.95
LM337T	1.95	NE550A	1.30	LM4500A	3.25
LM337MP	1.15	NE555V	.39	ICL8038B	4.95
LM338K	6.95	LM556N	.99	LM13080N	1.29
LM339N	.99	NE564N	3.95	LM13600N	1.49
LM340K-5	1.35	LM565N	1.25	75138N	1.95
LM340K-12	1.35	LM566CN	1.95	75450N	.89
LM340K-15	1.35	LM567V	1.25	75451CN	.39

CAPACITOR CORNER

50 VOLT CERAMIC DISC CAPACITORS

Value	1-9	10-99	100+	Value	1-9	10-99	100+
10 pf	.08	.06	.05	.001µF	.08	.06	.05
22 pf	.08	.06	.05	.0047µF	.08	.06	.05
47 pf	.08	.06	.05	.01µF	.08	.06	.05
100 pf	.08	.06	.05	.022µF	.09	.07	.06
220 pf	.08	.06	.05	.047µF	.09	.07	.06
470 pf	.08	.06	.05	.1µF	.15	.12	.10

100 VOLT MYLAR FILM CAPACITORS

.001mf	.12	.10	.07	.022mf	.13	.11	.08
.0022mf	.12	.10	.07	.047mf	.21	.17	.13
.0047mf	.12	.10	.07	.1mf	.27	.23	.17
.01mf	.12	.10	.07	.22mf	.33	.27	.22

+20% DIPPED TANTALUMS (Solid) CAPACITORS

.1/35V	.39	.34	.29	1.5/35V	.41	.37	.29
.15/35V	.39	.34	.29	2.2/35V	.51	.46	.34
.22/35V	.39	.34	.29	3.3/25V	.53	.47	.37
.33/25V	.39	.34	.29	4.7/25V	.63	.56	.45
.47/35V	.39	.34	.29	6.8/25V	.79	.69	.55
.68/35V	.39	.34	.29	15/25V	1.39	1.25	.95
1.0/35V	.39	.34	.29	22/6V	.79	.69	.55

MINI. ALUMINUM ELECTROLYTIC CAPACITORS

	Axial Lead				Radial Lead		
.47/50V	.16	.14	.10	.47/25V	.15	.13	.12
1.0/50V	.19	.16	.12	.47/50V	.16	.14	.13
3.3/50V	.17	.15	.11	1.0/16V	.15	.13	.12
4.7/25V	.18	.15	.11	1.0/25V	.16	.14	.13
10/25V	.18	.15	.11	1.0/50V	.17	.15	.14
10/50V	.19	.16	.12	4.7/16V	.15	.13	.12
22/25V	.19	.16	.12	4.7/25V	.16	.14	.13
22/50V	.24	.20	.18	4.7/50V	.17	.15	.14
47/25V	.25	.21	.19	10/16V	.15	.13	.12
47/50V	.29	.25	.23	10/25V	.16	.14	.13
100/25V	.28	.24	.22	10/50V	.17	.15	.14
100/50V	.41	.37	.34	47/50V	.25	.21	.19
220/25V	.39	.34	.33	100/16V	.21	.17	.14
220/50V	.49	.45	.41	100/25V	.25	.23	.21

kilobaud Peterborough NH 03458

MICROCOMPUTING T.M. LIST OF ADVERTISERS

Reader Service Number		Page
121	AB Computers	230
273	ABM Products	230
39	AM Electronics	94
91	Aardvark Technical Services	63
292	Aardvark Technical Services	158
109	Adventure International	169
59	Amdek Corp	28
56	American Square Computers	197
314	Apple-jack	75
314	Apple-jack	191
134	Applied Analytics, Inc	93
220	Aristo/Polks	123
192	Audio Video Systems	146
96	Automated Equipment, Inc	160
55	Automated Simulations	115
166	Bap$ Software	237
484	John Bell Engineering	230
99	John Bell Engineering	171
477	Bit 3 Computer Corp	228
490	CDS Corp	234
110	CFR Assoc	232
256	CPU Shop	175
79	C & S Electronics Mart Ltd	37
481	California Computer Systems	231
197	Card Electronics	128
58	Checks to Go	18
94	Compleat Systems	199
90	CompuCover	185
43	Compumart	220,221
147	CompuServe	85
32	CompuSoft Publishing	47
320	Computer Case Company	182
278	Computer Connection	129
133	Computer CTY	202
18	Computer Design Labs	133
120	Computer Discount of America	75
*	Computer Distributors	236
80	Computer Services	52
36	Computer Shopper	149
105	The Computer Stop	187
283	The Computer Stop	183
227	Computer Wholesale	155
6	Computronics	81
297	Concord Computer Components	223
292	Coosol, Inc	93
176	Cornsoft Group	147
141	Custom Electronics, Inc	50
*	Cybernetics, Inc	199
145	DG Electronic Development	201
293	D & N Micro Products	142
34	Dr. Daley	201
63	Davis Systems	154
*	Digital Research Computers	216,217
*	Digital Research Parts	38
61	Digital Systems Engineering	165
478	Dip, Inc	228
250	Discount Software Group	190
87	Dwo Quong Fok Lok Sow	149
485	Dwo Quong Fok Lok Sow	236
488	ECX Co	234
82	Ecosoft	157
339	Educational Courseware	92
93	Electronic Specialists	144
*	Electravalue Industrial	148
25	Electronics Book Club	51
254	Erickson Communications	108
254	Erickson Communications	152
57	Exatron	128
70	FMG Corp	139
131	Fireflyer Computing	128
474	Frisbee Electronics	232
22	Gimix, Inc	229
104	Global Parameters	96
42	Godbout	219
5	Hanley Engineering	132
236	Heath Co	CIII
10	Hobby World Electronics	215
49	Home Banking Systems	87
168	Honders, Inc	83
491	Houston MicroComputer Technologies	234
33	Human Engineered Software	236
209	Ian Electronics	142
40	Instant Software	104,105,124,125,166,167,187,191,195
77	Integrand Research Corp	132
151	Interface, Inc	140
235	Interlude	25
195	Interpretive Education	165
343	Intertec Data Systems	3
196	Intertec Data Systems	99
180	J.E.S. Graphics	187
92	J.P.C. Products	129
126	JR Inventory Co	149
203	JWS Engineering	128
48	Jade Computer Products	212,213
41	Jameco Electronics	224,225
483	Jameco Electronics	231
247	Joe Computer	156
222	Kalglo Electronics	120
223	Key Bits, Inc	154
489	Key Bits, Inc	234
*	Kilobaud Microcomputing	109,128,204-209,236
198	LNW Research	142,153
23	Level IV Products, Inc	37
*	Lifeboat Assoc	26,27
59	Leedex	28
207	Macrotronics	148
31	Marinchip Computer Systems	33
239	Mark Gordon Computers	150
84	Mark Gordon Computers	143
161	Meta Technologies	7
108	Micro Architect	69
216	The Micro Clinic	103
167	Micro Computer Industries	145
100	Micro Management Systems	179
72	Micro Media Magazine	156
154	Micro Technology, Unltd	58
260	The Microcomputer Warehouse	146
68	Micromail	91
253	Micron, Inc	241
123	Microsette	86
*	Midwest Scientific Instruments	76,77
*	Mikos	211
255	Miller Microcomputer Services	103
275	Mini Micro Mart	42
50	Mini Micro Mart	239
304	Mini Micro Mart	45
497	Monument Computer Service	236
480	Motorola, Inc	228
*	Mullen Computer Products	121
81	Multi Business Computer Systems	232
*	NRI Schools	159
*	Netronics R & D Ltd	41, 46, 90, 214
291	New England Business Services, Inc	151
276	OK Machine & Tool	129
113	Official Software Buyer's Guide	92
4	Ohio Scientific	CIV
130	Olensky Brothers	89
89	Omega Sales Co	123
276	Omni Communications Co., Inc	69
140	Omnitek Systems	96
29	Optimal Technology, Inc	191
310	Orange Micro	186
149	Osborne Assoc	73
106	PAIA Electronics	174
107	PAIA Electronics	182
19	Paccom	231
274	Pacific Exchanges	158
246	Pacific Exchanges	231
153	Pacific Office Systems	204
71	Pan American Electronics	134
98	Peek-65	237
13-16	Percom Data Co	CII
266	Perry Oil & Gas	80
303	Personal Computer Systems	141
204	Prism Software	50
277	Programma International	163
11	Programma International	11
103	Programma International	59
202	Progressive Computing	152
*	Quality Software	233
137	Quant Systems	148
44	Quest Electronics	222
46	RKS Enterprises	160
52	RNB Enterprises	218
101	Racet Computes	153
492	Racet Computes	234
*	Radio Shack	17
*	Rainbow Computing	237
486	Rainbow Computing	236
142	Random Access, Inc	52
*	Realty Software Co	50
20	The Robb Report	235
201	Rochester Data	37
74	Rondure Company	52
143	SBSG	162
117	Scientific Engineering Labs	96
208	Service Technologies, Inc	161
12	Simutek	69
67	Sirius Systems	120
132	68 Micro Journal	92
231	Small System Software	89
257	Snapp, Inc	97
322	Software Mart	116,117
498	The Software Toolworks	236
487	Sonex Systems	234
306	Spectrum Software	71
288	The Stocking Source	110
494	Stoneware Microcomputer Products	234
189	TAB Sales Company	162
350	Tang Data Corp	47
233	Tarheel Software Systems	146
475	Taylor Engineering	232
53	Technical Innovations	237
139	Tecmar, Inc	89
328	Texas Computer Systems	72
65	Tora Systems	173
95	Total Information Services	158
263	US Robotics	120
181	US Robotics, Inc	157
221	US Robotics	161
186	Unique Systems	21
64	VR Data Corp	67
158	Vandata	74
482	Videx	232
496	Video Business Systems	234
45	Wallen Electronics	210
*	Wameco, Inc	211
122	World Wide Electronics	103
200	Xtrasoft	237

*This advertiser prefers to be contacted directly.



For further information from our advertisers, please use the Reader Service card

LETTERS (from page 24)

I am puzzled why any surplus—positive or negative—is not simply returned (deducted from) to the principal and thus earn income.

The hypothesized 30-year duration of the home mortgage is not used. In fact, it is not needed, since the duration is completely determined by the principal, interest rate and payment. However, the program does not use this, and we find the curious phenomenon where the equity exceeds the value. (In actual fact, the widow's cost of living is reduced—often an important item in estate planning.) Correction of this item would require some programming changes around line 310.

Albert Nijenhuis
Philadelphia, PA

Any economic model like this one must make explicit and implied assumptions that must also be changed often to fit actual new situations and/or the need for revised projections (especially in complex projections such as estate planning or the American national budgeting process). But, Mr. Nijenhuis' suggestions are interesting and will be given serious consideration in my continuing revision of the estate program.

Dr. James Owens
Washington, D.C.

Heath's Sales

In the October "Publisher's Remarks" (p. 6) you state that Heath lost "tens of millions of dollars in sales" by not using the S-100 bus. Actually, Heath has virtually cornered the market for the kind of microcomputer they sell—the mainframe build-it-yourself computer. No one else can match their price for a complete mainframe, power supply, CPU and intelligent front panel (under $300 for the H8). Their bus is free of the glitches and incompatibility problems that have plagued the S-100, and there are plenty of boards for it from various manufacturers.

As for lack of advertising, anyone who is inclined to build electronic kits knows about Heath. They got off to a slow start in software, but they now have a good selection of that as well. Their sales may be small compared to Radio Shack's, but they are not really competing with them.

I would also like to correct a couple of bugs in my article "Upgrading the Heath H8 with a Z-80" (October *Microcomputing*, p. 50). In the caption for Fig. 1, the word "isn't" should be changed to "is." Also, I failed to mention that even if the pins are shortened on the adapter, the CPU board will still not fit in the first slot of the motherboard unless the speaker wire connectors on the back of the front panel board are shortened or removed.

After I wrote the article, I designed a PC board version of the adapter and was planning to build a few and sell them, but I have had trouble making the boards. I would welcome suggestions (or questions about my article) from readers.

Patrick Swayne
2155 Welch Dr.
Stevensville, MI

Refreshing

I read with great interest Wayne Green's "Publisher's Remarks" in the October issue. This was the first opportunity I have had to look at your magazine, and it was a refreshing introduction to read Wayne's article. I thought his articles "Five Years Ago, Five Years Hence" and "The Detroit Syndrome" are classics.

I have been in the process of attempting to select a computer for my law office to do the things I want it to do today and yet have the expandability of taking care of next year and the following year's work. I have written to several of today's "leading manufacturers" indicating my interest and needs and uses for which we want to put the computer but have received no response from the "big ones." It is refreshing to note, however, that the smaller companies in the field are more than happy to respond.

Please continue with these articles, and I am looking forward to seeing the forecasted effect the Japanese market will have on the American firms. It is not that we need such a market, but competition seems to do a lot of good things to the big giants, as has been demonstrated in the automobile business today. Thank you for writing an article which I can understand and particularly for addressing the ordinary reader rather than the genius who normally works with computers.

Malcolm H. Aukerman
Newport, IN

TRS-80 to the Rescue

We are a young and small manufacturer of electronic controls, competing with many large corporations for business in the marketplace. We have invested in a Radio Shack TRS-80 Model I, with 48K, disk drives and printer. We have had this microcomputer on line for about one year. Since that time, we have placed our bookkeeping on the computer to age payables/receivables without hourly wage costs and report formats. This has saved us approximately $2500 per year in outside bookkeeping costs.

Additional services include simple word processing to provide technical manuals, installation/operation instructions and list pricings. Since these items require managerial/engineering time to change, considerable money has been saved simply through the ability to make small changes without starting all over again.

As a small corporation in the high growth stage of its life, we are constantly updating sales projections, cash flow projections, etc. This required literally days of managerial time in revision and specification. With the Visicalc program (recently introduced by Radio Shack), I was able to project cash flow in a matter of hours. This has further enhanced the computer's ability to pay for itself.

This is not to say that the microcomputer is a panacea for all corporations. But the computer has allowed us to remain at lower overhead than our competition and continue the "small company" ability to respond quickly. The low price tag for the system (approximately $3500, including software) has allowed us to afford a system which we could not otherwise.

Without the computer, we would still be in business and still be performing many of the same functions we are now, but at higher overhead cost. The computer has allowed us to reduce that increase in overhead.

Marc Hanlan
President
MM&T, Inc.
Appleton, WI

Software Dilemma

Your editorial in the November issue ("Business Microcomputers: Still a Ripoff?" p. 6) shows unusual insight concerning the microcomputer software dilemma. Most off-the-shelf software is so defective, we refuse to even evaluate new offerings. It costs us an average of five times the retail price to thoroughly evaluate a program. We will never buy software without code, not because we wish to steal it, but because we end up debugging it at our cost.

The small-business person has not been dealt a full deck, and computer firms with high integrity cannot afford to help him. I cannot even afford the luxury of explaining the difference between a sophisticated and a low-cost micro. The business person looking at the low-cost unit will want to hold me accountable for his software problems, and life is too short. Five hours spent selling a $30,000 installation to a potentially happy customer is far more gratifying than spending 50 minutes selling $5000 of disenchantment.

James E. Knowles
President
Synergistics International Ltd.
Elgin, IL

NEW PRODUCTS

Edited by Dennis Brisson

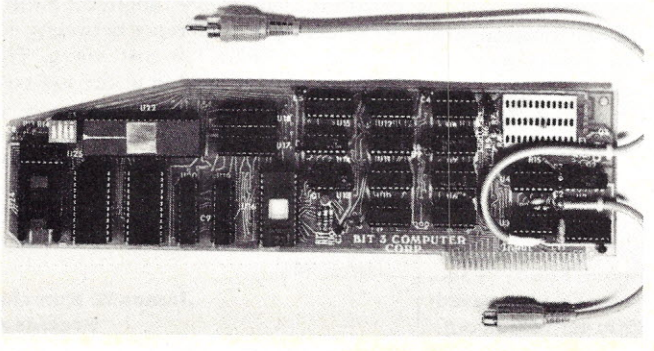
Motorola's 8-bit microprocessor
6502 Microcomputer
Dot matrix printer
Real-time clock for Apple and TRS-80

80-Column Apple II Card

The Full-View 80 is an 80×24 upper/lowercase plug-in card that provides 80-column capability for the Apple II computer while retaining the standard Apple II 40-character and graphics operating mode. You can select the different displays via a keystroke or under program control. A 7×9 dot character size model and a 5×7 dot character size model, which is suited for 8 MHz and other low-performance monitors, are available. Both have upper and lowercase characters. Custom-designed character sets are available via two EROM-type versions (127 and 255 characters).

On-board 2K ROM provides full keyboard editing, complete cursor control and tabbing. Several operating modes are available. The firmware incorporates Pascal and BASIC protocols so you don't have to enter machine-language programs or change Pascals, miscellaneous information or GOTOXY files. Price is $395.

Bit 3 Computer Corporation, 1890 Huron St., St. Paul, MN 55113. Reader Service number 477.



80×24 Apple II display card from Bit 3 Computer Corp.

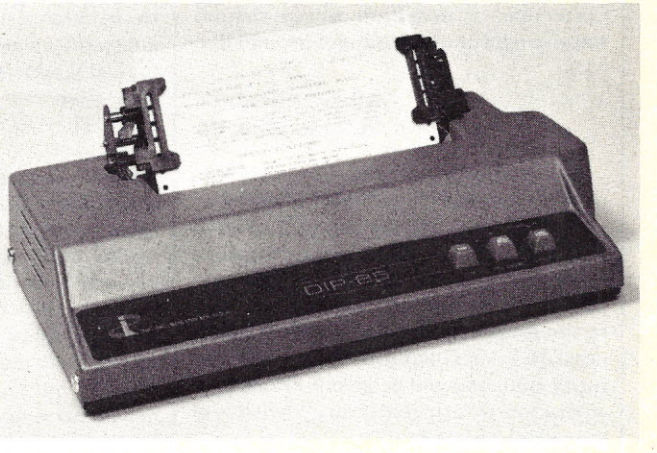
Dot Matrix Printer

The DIP-85 Data Impact Printer features 7×7 or 14×7 dot matrix, six different character sizes, 100 cps bidirectional print speed, selectable tractor or friction paper feed and long-life ribbon cartridge loading. It has variable line density and continuous form length controls. It can be operated at 100 percent duty cycle continuously without overheating.

DIP-85's high-resolution dot addressable graphic capability can provide plotting, CRT screen graphics, illustrations and special-effect symbols. Its telecommunication capability includes standard baud rate up to 9600, parallel, serial RS-232C as well as X-on X-off transmission control and a standard 1K buffer.

With a full 96-character ASCII set, it is capable of both uppercase and lowercase printing at 80, 96 or 132 characters per line on 8 1/2-inch wide paper. Paper feed is at the rate of 10 lines per second. Operator control includes power, select/deselect, line feed, top of form, self test and variable vertical tab setting. The 17×9.75×6.5 inch printer costs $895.

DIP, Inc., 745 Atlantic Ave., Boston, MA 02111. Reader Service number 478.



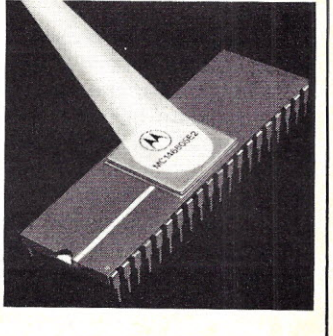
The DIP-85 dot matrix printer.

CMOS Processor

The MC146805E2 is a new eight-bit CMOS microprocessor—the first in a series of planned CMOS microcomputer parts announced by the MOS Integrated Circuits Division of Motorola, Inc., 3501 Ed Bluestein Blvd., Austin, TX 78721. It has 61 basic instructions that are similar to those of the popular MC6800 microprocessor, plus a complete set of bit-manipulation instructions to allow any bit in RAM or any I/O pin to be individually set or cleared with a single instruction.

The low power requirement, 20 mW at 1 MHz and less than 1 mW in standby, is useful for those applications where power is a major consideration (portable instruments, telecommunications, point-of-sale terminals, appliance controllers). The voltage range is three to six volts.

On-chip functions include an eight-bit timer with software programmable seven-bit prescaler, 112 bytes of RAM and a clock generator. The multiplexed bus has an 8K



The Motorola MC146805E2 eight-bit microprocessor.



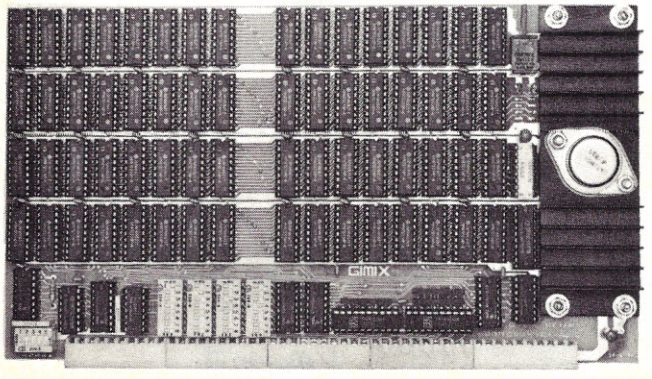
LOOK

WHAT'S COOKING on the FIFTY BUS

32K STATIC RAM BOARDS

Designed for use with:

★ **Existing SS50 Systems** ★ **SS50C Extended Address Systems**



- Assembled
- Burned In
- Tested

16K . . . $328.12

24K . . . $438.14

32K . . . $548.15

16K and 24K Versions are socketed for 32K and require only additional 2114's for expansion.

FEATURES:

- Decoding for 4 Extended Address Lines (allows memory decoding up to 1 megabyte)
- DIP-switch to set extended addressing or disable it
- 4 separate 8K blocks, addressable to any 8K boundary by DIP-switch
- Each 8K block may be individually disabled
- Write protect either of two 16K sections
- Low power consumption — uses 2114L low power RAMS
- Fully Socketed
- Gold Bus Connectors
- Guaranteed 2MHz operation

AND NOW . . . GIMIX OFFERS YOU A Choice of 6800 or 6809 CPU CARDS

You can order your system to fit your needs or select one of the below featured systems. Please contact the factory for further information and availability.

Add as much memory as you need using **GIMIX Static RAM Cards** for the utmost in reliability.

32K 6800 SYSTEM $1,694.59
Includes: Chassis, 6800 CPU, 32K RAM BOARD, I/O card

32K 6809 SYSTEM $1,844.69
Includes: Chassis, 6809 CPU, 32K RAM BOARD, I/O card

32K 6809 PLUS SYSTEM $1,994.79
Includes: Chassis, 32K RAM BOARD, I/O Card, and features our 6809 PLUS CPU Card with the Time of Day Clock option with battery back-up installed, as well as the 6840 Timer Package that provides 3 independent 16 bit counters.

This system also allows the following options to be added at additional cost:

- Battery back-up of the 1K RAM by substituting CMOS parts.
- A 9511 or 9512 Arithmetic Processor.
- GIMIX or SWTP Dynamic Address Translators.

EXPORT NOTES:

For 50Hz 230V C.V. POWER SUPPLY . . . . . Add $30.00
80 x 24 VIDEO BOARDS — Specify Format (No Added Charge)

On Orders under $250.00 for a Single Board, or Chips, please Add $30.00 Handling and we will ship Air Mail Prepaid. On all other orders we will ship via Emery Air Freight Collect, and we will charge no handling. All orders must be prepaid in U.S. Funds. Please note that foreign checks have been taking about eight weeks for collection, so we would advise wiring money or checks drawn on a bank account in the U.S. Our bank is the Continental Illinois National Bank of Chicago, Account #73-32033. Visa or Master Charge also accepted.

FACTORY PRIME STATIC RAMS

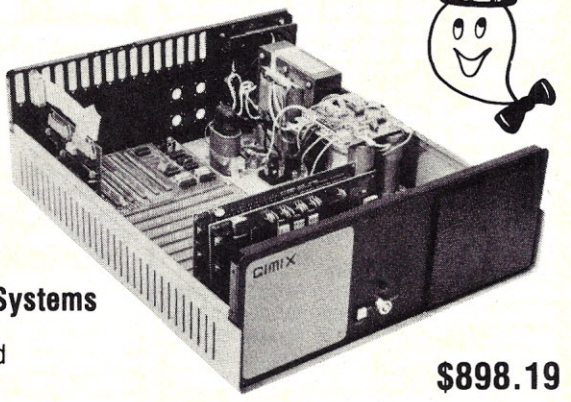
2114L 450 ns . . $5.90 300 ns . . $6.40 200 ns . . $6.90

4044 450 ns . . $5.90 250 ns . . $6.90

ADD $5.00 HANDLING ON ORDERS UNDER $200.00

GIMIX® and **GHOST®** are Registered Trademarks of GIMIX INC.

THE CLASSY CHASSIS



$898.19

- 25 amp (5V) ferro-resonant constant voltage power supply,
- Heavy weight aluminum cabinet with 3 position key switch, fan, and provisions for two 5'' disk drives;
- 6800/6809 Mother Board, fifteen 50 pin and eight DIP-switch addressable 30 pin slots (gold plated pins), fully decoded;
- Baud rate generator on I/O section of Mother Board.

I/O BOARDS

for the 30 PIN BUS:

1 Port Serial (RS 232 or 20MA, current loop)	$ 88.41
2 Port RS 232 Serial	128.43
2 Port Parallel	88.42

for the 50 PIN BUS:

8 Port RS 232 Serial	288.40
8 Port RS 232 Serial with on board Baud Rate generator.	318.46
8 Port Parallel	198.45

BOTH 6809 SYSTEMS FEATURE OUR NEW TERMINAL BASED GMXBUG 09 SYSTEM MONITOR

GMXBUG 09 includes advanced debugging tools, utility, and memory manipulation routines.

Both 6809 Systems:

★ Can be reconfigured to allow use of other system monitors (OS-9 and SBUG-E)

★ Include 1K of Scratchpad RAM on the CPU

★ Allow optional software switching of system monitors.

2MHz 6809's at slight additional cost when they become available.

Phone, write, or see your dealer for details and prices on our broad range of Boards and Systems for the SS50/SS50C bus and our AC Power Control Products for all computers.



✓22

GIMIX INC.

The Company that delivers

Quality Electronic products since 1975.

1337 WEST 37th PLACE, CHICAGO, IL 60609

(312) 927-5510 • TWX 910-221-4055

6502	7.45	10/6.95	50/	6.55	100/	6.15
6502A	8.40	10/ 7.95	50/	7.35	100/	6.90
6520 PIA	5.15	10/ 4.90	50/	4.45	100/	4.15
6522 VIA	6.90	10/ 6.50	50/	6.10	100/	5.70
6532	7.90	10/ 7.40	50/	7.00	100/	6.60
2114-L450		4.45	20/	4.25	100/	3.95
2114-L300		5.65	20/	5.35	100/	4.95
2716 EPROM (5 volt)		13.45	5	/12.75	10/	11.85
2732 EPROM (5 volt)						42.00
4116-200 ns RAM (NEC)						**8 for 41.90**
6550 RAM (PET 8K)						12.70
S-100 Wire Wrap $2.65				Solder Tail		$2.15

A P Products 15% OFF

A P HOBBY-BLOX 15% OFF

All books 15% off

KIM-1	$159
SYM-1	$209
KTM 2/80	$349
Leedex Monitor	$129
Centronics 737	$800
C-10 Cassettes (AGFA PE611)	10/5.65
NEC Spinwriter-parallel	$2450
XYMEC HI-Q 1000	$2150
Zenith Z19 Terminal	$739
Zenith Z89 with 48K	$2150
FORTH+ for PET or APPLE (full FIG version)	$60
PASCAL for PET	$75
Z80A 64K +2.4 Meg Disk	$3500

DISKS
(write for quantity prices)

SCOTCH (3M) 8"	10/3.00	50/2.85	100/2.75
SCOTCH (3M) 5"	10/2.95	50/2.80	100/2.70
Maxell 5"	10/3.65	50/3.40	100/3.15
Maxell 8" Double Dens.	10/4.10	50/3.95	100/3.80
Verbatim 5"	10/2.40	50/2.35	100/2.30
(add 1.00 for plastic storage box)			
BASF 5" soft	10/2.40	20/2.35	100/2.30
BASF 8" soft	10/2.40	20/2.35	100/2.30
Diskette Storage Pages			10 for 3.95
Disk Library Cases		8"-2.85	5"-2.15



COMMODORE PET-CBM
Write or call for quotes
NEW 8016/32 80 column screen
NEW 8050 950K Dual Drive
EDUCATIONAL DISCOUNTS AVAILABLE

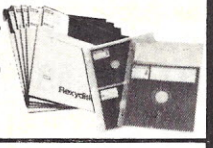
ATARI 800 $777
All Atari Modules 25% OFF
SPECIAL-purchase ATARI 800, receive extra 8K memory FREE.
EDUCATIONAL PLAN – buy 2 ATARI Computers, receive 1 ATARI **FREE!**

WRITE FOR CATALOG
Add $1.25 per prepaid order for US shipping (UPS)

✓121
A B Computers
115 E. Stump Road
Montgomeryville, PA 18936
(215) 699-5826

SPECTACULAR
Offers

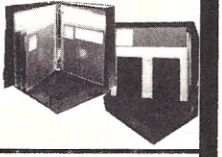
BASF "FLEXYDISK" Superior quality data storage medium, certified and guaranteed 100% error free.
5¼" or 8"* Diskettes 10/ $24
5¼" or 8" Vinyl Storage Pages 10/ $5
Write for quantity discounts
*Single sided / Single Density



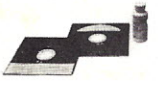
SFD CASSETTES "Super Ferro Dynamic" Using the finest Agfa PE 611 tape in a professional quality housing.
C-10 Cassette Sonic Weld Housing 10/ $7
Add 10¢ p/cassette for 5 screw housing
Cassette Album Page $1.89
Write for quantity discounts



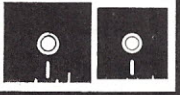
LIBRARY CASE 3-ring binder album, Protects your valuable programs on disks or cassettes. Fully enclosed and protected on all sides similar to Kas-sette storage box.
Library 3-ring binder $6.50
5¼"mini Kas-sette/10 $2.49
8" Kas-sette / 10 $2.99
Write for quantity discounts



DISKETTE DRIVE head cleaning kits prevent head crashes and insure efficient error-free operation.
5¼" or 8" KIT
INTRODUCTORY PRICE $19.50

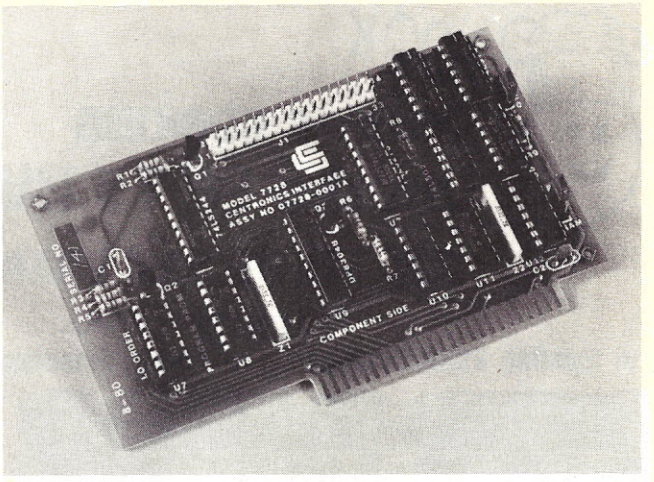


HARDHOLE reinforcing ring of tough mylar protects your disks from damage.
8" applicator $4.00
5¼" applicator..... $3.00
8" mylar hardholes (50) . $8.00
5¼" mylar hardholes (50) $6.00



✓273
ABM PRODUCTS
631 "B" St.
San Diego, CA 92101
(714) 235-6602

VISA • MASTERCHARGE • MONEY ORDERS CERTIFIED CHECK • FOR PERSONAL CHECKS ALLOW 2 WEEKS • C.O.D. REQUIRES A 10% DEPOSIT • CAL. RES. ADD 6% SALES TAX MIN. $2 SHIPPING & HANDLING • MINIMUM ORDER $10 • SATISFACTION GUARANTEED OR FULL REFUND.



The Model 7728 from California Computer Systems.

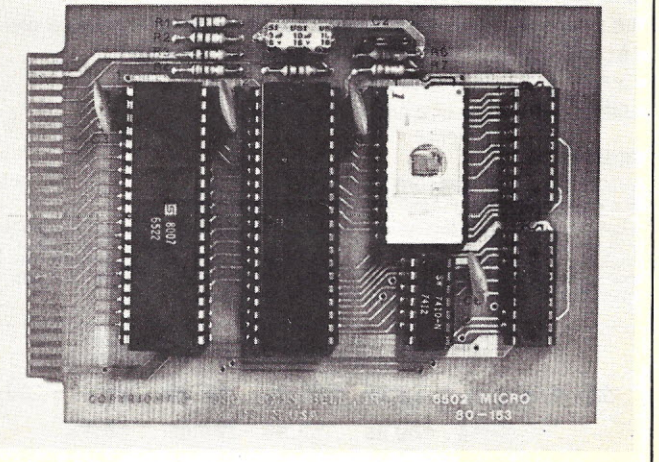
byte addressing range. A 2K byte CMOS ROM, the MCM65516, is a companion part also available. Price is $45. Reader Service number 480.

6502 Microcomputer

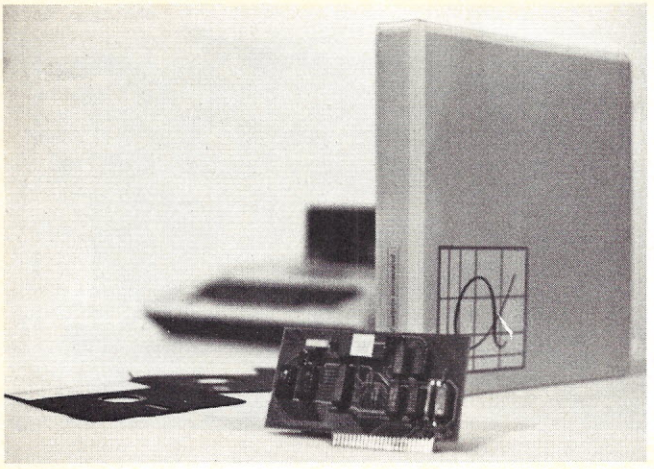
The 6502 Microcomputer from John Bell Engineering, PO Box 338, Redwood City, CA 94064, features 1024 bytes of RAM (two 2114s), 2048 bytes of EPROM (2716) and uses one 6522 VIA, which provides two 16-bit programmable timer/counters, serial data port and latched output and input with handshaking logic. It is TTL and CMOS compatible. It is designed to control functions such as temperature, burglar alarms and lights, as well as home appliances, and is also being used for controlling solar heating and power systems and irrigation systems. Prices are $110.95 for the assembled unit, $89.95 for the kit and $24.95 for the bare board. Reader Service number 484.

Apple II Printer Interface

The Model 7728 Centronics printer interface gives Apple II users compatibility with printers using Centronics-type parallel interfaces, such as the Integral Data Paper Tiger, the Okidata Microline 80, the Microtek MT-80P and the MPI 88T, as well as Centronics printers. An on-board 256-byte ROM provides driver firmware and controls ASCII character output to the printer. The driver responds to standard Apple II printer commands for easy selection of command characters, characters per line, auto feed and video echo. Users who choose to develop their own drivers may replace the standard



John Bell Engineering's 6502 Microcomputer.



The Microspeed Language System from Applied Analytics.

ROMs and RAMs. A ROM/RAM jumper makes the necessary logic changes.

The 7728 may reside in any Apple II peripheral slot 1–7. It supports the interrupt daisy chain with arbitration logic including jumper-selectable IRQ generation, and provides DMA daisy chain pass-through. The printer interface includes an eight-bit data output bus, four status inputs, data strobe and acknowledge handshake signals and a printer reset signal. Price is $119.95; cables are available separately.

California Computer Systems, 250 Caribbean Drive, Sunnyvale, CA 94086. Reader Service number 481.

Microspeed System for Apple II

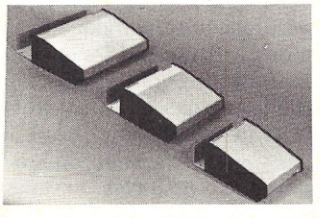
The Microspeed Language System is a hardware/software package that enables Apple II users to run programs at six to 60 times faster than Applesoft BASIC. It employs the Am9511 Arithmetic Processor in conjunction with an interactive compiler to provide increased performance for the Apple II and II+.

The disk-based system offers an enhanced set of programming capabilities beyond those of Applesoft, including print formatting, fast high-resolution plotting, "turtle" graphics and extended, high-speed mathematical functions. The system preserves the desirable features of the Forth concept, including extensibility, inherent program structuring, ease of software development and compactness of compiled code. System utilities include a text editor and mini-assembler; either or both may be loaded optionally from disk. The $495 price includes the auxiliary processor card, Applesoft replacement ROM, 120-page user manual and system software diskettes.

Applied Analytics, Inc., 5406 Roblee Drive, Suite 500, Upper Marlboro, MD 20870. Reader Service number 476.

Computer Enclosures

A new designer series of desk-top enclosures to accommodate computer equipment has been introduced by Jameco Electronics, 1355 Shoreway Road, Belmont, CA 94002. Their four-piece construction enables easy access for servicing while providing strong protection. The end pieces are precision-mold high-strength epoxy with an internal slot (all around) to accept both top and bottom panels, which are aluminum. The enclosures are available in three width sizes: eight inches ($29.95), 10.65 inches ($32.95) and 14 inches ($34.95). The height is 3.15 inches, and the depth is 8.25

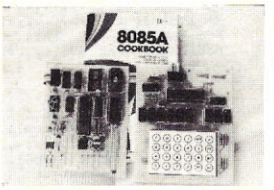


Jameco Electronics' computer enclosures.

LEARN MICROPROCESSING ON YOUR OWN COMPUTER!

You Learn How To:

- Design and code microprocessor software
- Use logic and Bit Manipulation Techniques
- Enter and execute programs on your own computer
- Understand Microprocessor Architecture and Support Chips
- Control Programmable Input/Output Ports
- Implement Real-Time Interrupt Handling and Data Transfer
- Design your own microcomputer



8085 MICROPROCESSOR TRAINING UNIT $299.95

RATED BEST VALUE BY INSTRUCTORS

You Receive:

- A fully tested and assembled 8085A Microcomputer with 1K RAM, 1K EPROM and 1k PROM Memory, Programmable I/O, Keyboard Unit, CPU Card, Display and Operating System, 44 pin edge connector can be configured to any bus structure, area on CPU Card for Custom wire-wrap design or user defined interface circuitry, completely expandable
- Complete Step-by-Step Instruction Manual
- Complete User's Manual with programs included
- 352 page 8085A Cookbook takes you from basic microprocessor concepts to actual design of an 8085A Microcomputer
- 344 page 8080/8085 Software Design Book 1 with over 190 executable program examples plus detailed examination of all 244 Instructions and typical assembly language program for the 8080/8085 Microprocessor.

Satisfaction Guaranteed. If not completely satisfied you may return the product within 30 days for a full refund

PACCOM
14905 NE 40th, Dept. KB1
REDMOND, WA 98052

FOR BANK CARD ORDERS:
CALL TOLL-FREE NUMBER:
1-800-426-6254 EXT. 91
✓19

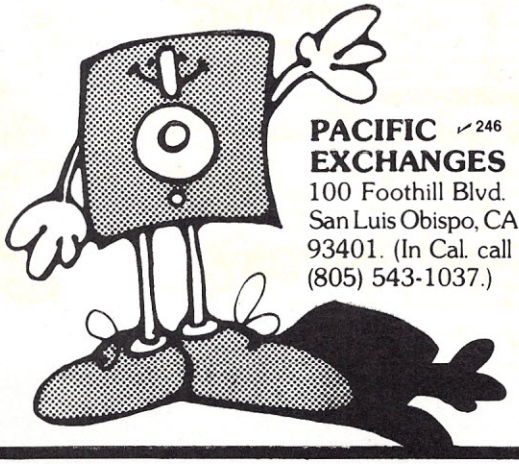
YES! I want to start learning Microprocessors. Please rush me:
☐ **8085AAT Microprocessor Training Unit at $299.95** plus $3.00 P & H
☐ 8085 Cookbook **21697 $12.95** ☐ 8080/8085 Software Book **21541 $9.50**

NAME _____ CARD NO. _____
ADDRESS _____ EXP. DATE _____
CITY _____ ☐ VISA ☐ MASTERCARD
STATE _____ ZIP _____ SIGNATURE _____

MEMOREX DISKETTES & CARTRIDGES

for your computer or word processor

BUY THE BEST FOR LESS. Lowest prices. **WE WILL NOT BE UNDERSOLD!!** Buy any quantity. Call free (800) 235-4137 for prices and information.



PACIFIC EXCHANGES ✓246
100 Foothill Blvd.
San Luis Obispo, CA 93401. (In Cal. call (805) 543-1037.)

✓Reader Service—see page 226

NORTH STAR HORIZON:

HRZ-2-32K-D-Factory ASM	$2275
HRZ-2-32K-Q-Factory ASM	$2675
64K DD or Q Also Available	
HDS-18-F	$4449
Northword DQ	$ 295
Mail Manager	$ 235
ACC. REC. OR ACC. PAY	$ 445
Medical-Dental SYS	$2500

COMMODORE (PET):

2001-32K-BorN Keyboard	$1090
8K and 16K Also In Stock!!!!	
8032 (80 Column Screen)	$1599
2040 Dual Floppy Drive	$1090
8050 Dual Floppy (1MEG)	$1599
2022 Tractor Printer	$ 749
Word PRO IV	$ 290
VISICALC	$ 195

APPLE II PLUS Call For Price!

ATARI 800	$ 849
TI 99/4 Console&Monitor	$1190

INTERTEC SUPERBRAIN:

32K RAM	$2595
64K RAM	$2795

PRINTERS

Letter Quality:

NEC 5510 or 5530	$2550
NEC 5520 KSR	$2950
DIABLO 630	$2390
C.ITOH	$1690

Dot Matrix:

CENTRONICS 730	$ 629
" " 737-1	$ 849
" " 799	$ 999
EPSON MX-80	$ 599
PAPER TIGER 460G	$1250
BASE II MST	$ 649

DISPLAY TERMINALS

HAZELTINE 1420	$ 949
" " 1500	$ 999
INTERTUBE III	$ 775
TELEVIDEO 920C	$ 849

Complete sales and service since 1977. Most items in stock, prices are subject to change. Visa and Master Charge Welcome.

Multi Business Computer Systems Inc.

Mon. thru Fri. 9:00 - 6:00
Sat. 9:30 - 3:00

28 Marlborough St. Portland, CT 06480
(203) 342-2747 TWX/TELEX 710-428-6345

✓81

More CFR Spectaculars!!!

Parallel Input 'Correspondence' SELECTRIC TYPEWRITER/PRINTER

Features:
- 15" Frame, 132 Columns
- Takes Std. Office 'Golf-Ball' Elements
- Parallel "Centronics-Type" T²L Input
- IBM 745 Printer Mechanism
- Upper & Lower Case ASCII In!
- Used, Reconditioned Terminals
- Ideal for Word Processing
- Use as a Typewriter, Too!



Complete, Ready to Use: **Only $659.00!!ea.**

Replacement Line Cord Included; No Type Element Included
*Add $20.00 for Handling & Packaging, Pay Shipping When Delivered

IBM Technical Data for 'Selectric' ..... $20.00ea.
—GET OUR BARGAIN-PACKED PERIPHERAL FLYER!!—

DAISY KSR ASCII TERMINALS

Featuring:
- 15" Frame, 132 & 156 Columns
- 15 & 30 Characters/Second
- Dual Pitch (10, 12 Chars./Inch)
- Diablo "Hytype" Printer
- Plotter Function w/ 1/60"H & 1/48"V Steps
- Simple RS-232-C ASCII I/O

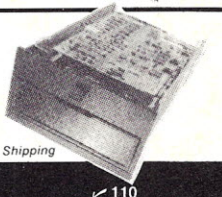


Includes Operator's Instructions, Schematics, Etc.
Add $35 for Shipping Crate. Pay Shipping on Delivery.

System 75 Daisy Terminals... $1499.00ea.

BARGAIN "FLOPPY" DRIVES

Removed from service, built by MPI Div. of Control Data. 9400 Series, takes Shugart-type 8" diskettes. Good cond., may need some service. Incl.: data, schematics, etc.



Only ..... **$229.00 each**
Buy 3 and SAVE BIG! 3/$599.00 *Plus Shipping*

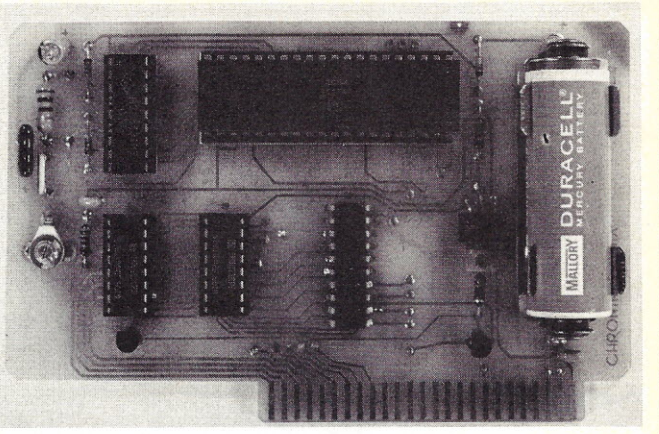
✓110

CFR Associates, Inc.

MAIL ORDERS: Box 144, Newton, N.H. 03858

PHONE ORDERS: 617/372-8536 (Sorry, No Collect Calls) Mastercharge & VISA Welcome

WAREHOUSE: 18 Granite St. Haverhill, Mass. 01830



Frisbee Electronic's Apple II clock module.

inches. Reader Service number 483.

Real-Time Clock for Apple II

The Chrontronix ACV-1 is a real-time clock for the Apple II that includes complete clock features (hr., min., sec., day, mo., yr.) plus programmable interrupts. Slot independent firmware which allows easy access from BASIC (three program lines) is provided. A set of software programs is also available on either cassette or disk to execute dating of forms, stopwatch functions and time conversions.

Standard features include power-down ROM, high-accuracy crystal and installed battery. Sockets are provided for either the standard firmware or 256 bytes of user ROM. Price is $109.

Frisbee Electronics, PO Box 556, Ridgecrest, CA 93555. Reader Service number 474.

TRS-80 Real-Time Clock

Now your Level II TRS-80 can perform real-time operations without the expansion interface with the RTC-10 from Taylor Engineering, 7805 Michael Lane, Huntsville, AL 35802. The RTC-10 runs continuously, keeping accurate time without interfering with cassette functions. You may program events for the same period with real-time interrupts (one per second), which permits preprogrammed activities to take place without derailing on-going programs.

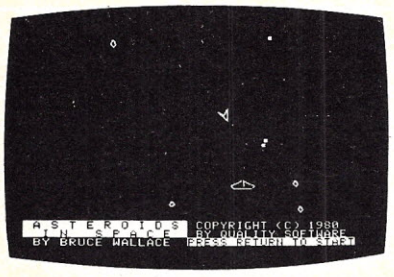
It features 12- and 24-hour operating modes, 12-hour mode AM/PM indicator bit and continuous display mode (continuously displaying time in the upper right hand corner of the screen). All modes are software controlled. The RTC-10 mounts securely inside the TRS-80 keyboard unit and is easy to install and remove without altering the original design of your computer. Price is $25. Reader Service number 475.

Keyboard Enhancer

With the Keyboard Enchancer from Videx, 897 N. W. Grant Ave., Corvallis, OR 97330, you can directly enter upper and lowercase characters from your Apple II keyboard. In addition to the original keyboard entry mode, the typewriter mode and the shift lock mode are keyboard selectable. In both of the last modes, the shift keys will perform exactly as they do on any typewriter.

The Keyboard Enhancer allows you to enter nine new characters directly from your keyboard utilizing the shift keys in conjunction with other alphabetic keys. A new power key cap is included with two built-in LEDs for instant positive identification of which mode you are in. The control key must be depressed with the reset key to activate the reset operation. The kit includes five ICs mounted on a PC board, the necessary mounting screws, a jumper cable, power key cap with LEDs and cable assembly and instructions. Price is $87. Reader Service number 482.

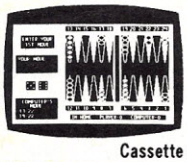
Software for the Apple II and Apple II Plus*





ASTEROIDS IN SPACE™
By Bruce Wallace
An exciting space action game! Your space ship is traveling in the middle of a shower of asteroids. Blast the asteroids with lasers, but beware — big asteroids fragment into small asteroids! The Apple game paddles allow you to rotate your space ship, fire its laser gun, and give it thrust to propel it through endless space. From time to time you will encounter an alien space ship whose mission is to destroy you, so you'd better destroy it first! High resolution graphics and sound effects add to the arcade like excitement that this program generates. Runs on any Apple II with at least 32K of RAM and one disk drive.

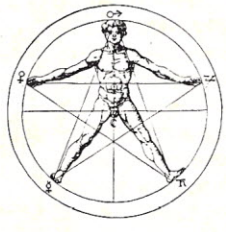
On Diskette - $19.95



FASTGAMMON™ By Bob Christiansen.
Sound, hi res, color, and musical cartoons have helped make this the most popular backgammon playing game for the Apple II. But don't let these entertaining features fool you — FASTGAMMON plays serious backgammon. Runs on any Apple II with at least 24K of RAM.

Cassette - $19.95 **Diskette - $24.95**

ASTROAPPLE™ by Bob Male.
Your Apple computer becomes your astrologer, generating horoscopes and forecasts based on the computed positions of the heavenly bodies. This program offers a delightful and stimulating way to entertain friends. ASTROAPPLE produces natal horoscopes (birth charts) for each person based on his or her birth data. Any two people may be compared for physical, emotional, and intellectual compatibility. The program is written in Applesoft BASIC with machine language subroutines. It requires either RAM or ROM Applesoft and at least 32K of memory.



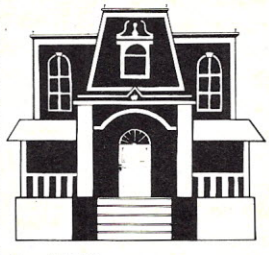
Cassette - $14.95 **Diskette - $19.95**



FRACAS™ by Stuart Smith.
A fantastic adventure game like no other! Up to eight players can participate in FRACAS at the same time. Journey in the land of FAROPH, searching for hidden treasure while warding off all sorts of unfriendly and dangerous creatures. You and your friends can compete with each other or you can join forces and gang up on the monsters. Your location is presented graphically and sound effects enliven the battles. Save your adventure on diskette or cassette and continue it at some other time. Both integer BASIC and Applesoft versions included. Requires at least 32K of RAM.

Cassette - $19.95 **Diskette - $24.95**

BENEATH APPLE MANOR™ by Don Worth.
Descend beneath Apple Manor into an underground maze of corridors, rooms, and secret passages in quest of rich and powerful treasures. The dungeon complex consists of many floors, each lower level more dangerous than the last. If you can reach the lowest level, you may even find the ultimate object of your quest, the fabled golden apple of Apple Manor. Strategy is extremely important as you deal with a variety of monsters, each with its own characteristics. Written in integer BASIC with machine language subroutines. Requires integer BASIC and at least 16K of RAM on cassette or 32K of RAM on diskette.



Cassette - $14.95 **Diskette - $19.95**

BATTLESHIP COMMANDER™ by Erik Kilk and Matthew Jew.

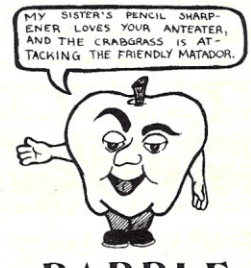




A game of strategy. You and the computer each start out by positioning five ships of different sizes on a ten by ten grid. Then the shooting starts. Place your volleys skillfully — a combination of logic and luck are required to beat the computer. Cartoons show the ships sinking and announce the winner. Sound effects and flashing lights also add to the enjoyment of the game. Both Applesoft and integer BASIC versions are included. Requires at least 32K of RAM.

Cassette - $14.95 **Diskette - $19.95**

BABBLE™ by Don Worth.
Have fun with this unique software. You write a story, entering it as a BABBLE program. As you write the story you specify certain words to be selected by the computer or entered from the keyboard at execution time. Run the program and watch BABBLE convert your story into an often hilarious collection of incongruities. The ways in which BABBLE can entertain you are limited only to your imagination. You can compose an impressive political speech or write poetry. You can plan a dinner menu. You can even form images on the screen or compose musical tunes with the help of BABBLE. The cassette version requires at least 16K of RAM and the diskette version requires at least 32K of RAM. BABBLE is written in machine language and runs on any Apple II computer.



Cassette - $19.95 **Diskette - $24.95**



LINKER by Don Worth.
Turn your Apple II or Apple II Plus into a powerful and productive software development machine with this superb linking loader/editor package. LINKER does the following and much more:

- Dynamically loads and relocates suitably prepared machine language programs anywhere in RAM.
- Combines a main program with subroutines. You can assemble a subroutine once and then use it with as many main programs as you wish.
- Produces a map of all loaded routines, giving their location and the total length of the resulting module.
- Contains a library of subroutines including binary multiplication and division, print text strings, delay, tone generator, and random number generator.

Linker works with virtually any assembler for the Apple II. Requires 32K of RAM and one disk drive.

Diskette - $49.95
Manual Only - $19.95

QUALITY SOFTWARE
6660 Reseda Blvd., Suite 105, Reseda, CA 91335
(213) 344-6599

Now exclusive distributors for products from The Software Factory, Newhall, California
*Apple II and Apple II Plus are trademarks of Apple Computer, Inc.

WHERE TO GET IT: Call us at (213) 344-6599 for the name of the Quality Software dealer nearest you. If necessary you may order directly from us. Mastercard and Visa cardholders may place orders by telephone. Or mail your check or bankcard number to Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335. California residents add 6% sales tax. SHIPPING CHARGES: Within North America orders must include $1.50 for first class shipping and handling. Outside North America the charge for airmail shipping and handling is $5.00. Pay in U.S. currency.

Reader Service—see page 226

NEW SOFTWARE

Edited by Dennis Brisson

Accounting system, PET/CBM graphics, Spelling dictionary, Bowling program

Accounting System

A complete accounting system for microcomputers with two eight-inch disk drives, standard CP/M, an 80×24 character terminal and Microsoft BASIC 5 is now available from Houston Micro-Computer Technologies, 5313 Bissonnet, Bellaire, TX 77401. The system functions as a single entry system; all transactions are passed automatically to the General Ledger. Departmental and master/sub accounts are easily used. Account numeric ranges, the income statement and balance sheet can be adjusted to match your present system. Check printing is easily done with both Accounts Payable and Payroll. Open invoice, balance forward and auto billing are all possible with Accounts Receivable. Invoices, statements, customer lists and aging reports are also easily produced. Reader Service number 491.

TRS-80 Utility Package

Racet Computes, 702 Palmdale, Orange, CA 92665, has recently introduced a utility package for the TRS-80 Model II system. It provides eight new DOS commands, and features the ability to:

reconstruct or recover data from bad diskettes
copy multiple files
examine/change diskette contents
catalog diskette directories
change disk names and create files

The entire package is written in machine language and is fully documented in a 124-page manual. Price is $150. Reader Service number 492.

Mail List

Mail List lets you easily prepare and organize mailing list labels and sort them four ways: alphabetically, as inactive or active, by zip code and by a designated six-character utility field. Designed for use with the Commodore CBM 16K and 32K computers with CBM 2040 disk drives and CBM or ASCII printers, Mail List stores up to 1050 records on a single disk. You can easily adjust the length of all fields. Price is $95.

CDS Corporation, 695 East Tenth North, Logan, UT 84321. Reader Service number 490.

Apple Terminal Emulator

Stem is a terminal emulator for connecting an Apple II to any mainframe computer at speeds to 1200 bits per second. It includes a switch to print all data as received or entered, converts lowercase to uppercase, discards unused control codes and generates BREAK with a single key input and auto restart on RESET. Support exists for standard Apple video and communications and parallel printer cards. Price is $15, tape or disk.

Video Business Systems, 59 Noyes St., Concord, NH 03301. Reader Service number 496.

6809 Word Processing System

Stylograph is a word processing system for 6809 computer systems operating under the Flex and OS-9 operating systems. The program features cursor-based editing with on screen formatting, which simplifies word processing tasks since there is no need for intermediate printouts to verify appearance of the text. Stylograph has a full array of editing and formatting commands. Prices are $150 for specialty printer versions and $135 for TTY-type printers.

Sonex Systems, Box 238, Williamsville, NY 14221. Reader Service number 487.

Service Analysis Tracker

The Service Analysis Tracker (SAT) is designed to analyze the operation of service-type operations (retail stores, counter service, vending) and determine the optimum scheduling strategy to maximize usage of people and/or machines. It uses a sampling system to determine times of the day when employees and/or equipment are actually needed for customer service. SAT determines when it is economical to staff and/or equip your operation in light of customer activity. It features a graphic overlay capability so you can see week-to-week and day-by-day trends. The program is available for the 48K Apple II ($219) and for 48K CP/M systems with addressable cursor terminals ($325).

Stoneware Microcomputer Products, 1930 Fourth Ave., San Rafael, CA 94901. Reader Service number 494.

PET/CBM Graphics Package

Curve is a graphics software package for 32K PET/CBM systems. It features capabilities to plot parametric, Cartesian or polar equations; data points or characters entered from the keyboard; shaded bar graphs in the vertical or horizontal orientation; linear and logarithmically scaled axes; and fully scalable alphanumeric character sets. Sixteen subroutines are included for use in custom programs. Curve incorporates built-in error messages that trap incorrect input quantities. It is designed to be used with the new Watanabe Digiplot plotter via the Com-plications, Inc., C102, IEEE-488 to Watanabe interface.

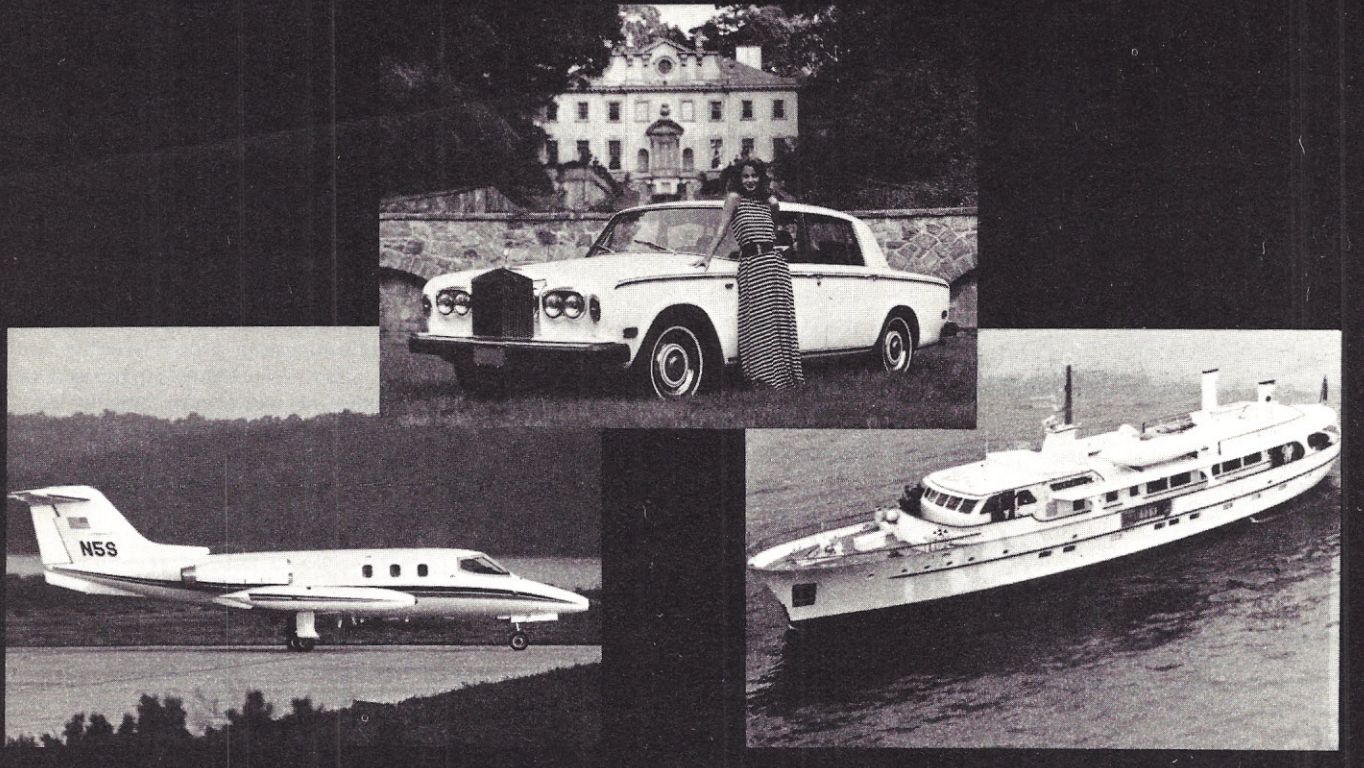
ECX Co., 2678 North Main St. #6, Walnut Creek, CA 94596. Reader Service number 488.

Spelling Dictionary for CP/M Users

WordSearch is an automated spelling word dictionary system that can help you eliminate misspelled words from your documentation, letters and other correspondence. Designed for use with MicroPro's Word Star and other users of CP/M-compatible word processing systems,

Hundreds of Rolls Royces, Yachts, Airplanes & Premium Properties

THE ROBB REPORT



THE ROBB REPORT, published monthly, is the market place for the buyer, seller and trader who appreciates the finer things in life. Listed for sale are hundreds of new and previously owned antique and classic motor cars, yachts, airplanes, premium properties horses, art, firearms and antique treasures. Complete descriptions and photographs are included, as well as the owner's name, address and telephone number.

A 12 month subscription to THE ROBB REPORT is $45.00*. Send your check to the address below. For even faster 24 hour service, call toll-free: 800-228-2606. (In Nebraska call 800-642-8777). For renewals or information call 404-256-9470.

The Robb Report

THE MAGAZINE FOR CONNOISSEURS

20

THE ROBB REPORT/P.O. Box 720317/Atlanta, Georgia 30328

*Add $100.00 for overseas subscription. Prices subject to change without notice.

SPECIAL PRICES

We offer a complete selection of hardware, software, peripherals.

apple

OHIO SCIENTIFIC
VECTOR GRAPHICS
COMMODORE PET

Immediate shipping.
VISA/MC accepted

Contact us for a catalog on specific products or call us for a quote.

Computer Distributors
P.O. Box 60284 K
Houston, TX 77205
(713) 821-2702

the wait is over!
THE 6502 ASSEMBLER
for your 8K PET
is now available!
PET™
by Jay Balakrishnan

Now that many 6502 Assembler books are available, this Assembler enables you to code machine language programs that run 100 or more times faster than BASIC

- Uses 1 tapedrive; almost 1K free for your machine language program
- Handles all opcodes & several pseudo-opcodes, and accepts hex/dec. operands
- Symbols are 6 characters in length, but that length is easily modified
- Versions for old and new ROMs included
- Comprehensive documentation includes separate User & Program Manuals which facilitates easy program enhancements
- Over 25 English language error messages also numbered for easy reference
- GUARANTEED to load or replaced FREE

only $15.95

Plus $1 Postage • Diskette - Add $2
(Calif. residents add 6% Sales Tax)

33
HES
Human Engineered Software
3748 Inglewood Blvd. Room 11
Los Angeles, California 90066

VISA
(213) 398-7259
dealer inquiries welcomed

WordSearch quickly processes any text file, isolates a list of the unique words used, compares these words to a library of correctly spelled words and identifies any words used that were not found in the spelling dictionary. It then allows any valid words encountered to be automatically added to the spelling dictionary. WordSearch also locates the words within your text and clearly identifies them for rapid correction. Available on eight-inch single-density diskette. WordSearch costs $195.

Key Bits, Inc., PO Box 592293, Miami, FL 33159. Reader Service number 489.

OSI Word Processor Justification

Now justification is available for the WP6502 word processor from Dwo Quong Fok Lok Sow with the DQ Justify I package. DQ Justify I allows the addition of TTY justification and centering at all ports and micro spacing justification with underlining for the Parallel NEC Spinwriter.

Price is $50 for either the OS65D or OS65U version on eight-inch or five-inch diskettes. It will install itself on the WP6502 master disk.

Dwo Quong Fok Lok Sow, 23 East 20th St., New York, NY 10003. Reader Service number 485.

Heath/Zenith Software

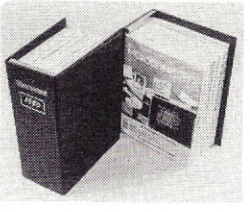
A new line of software tools for word processing, software development and time-sharing access for Heath/Zenith 8080/Z-80 computers has recently been introduced by The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423.

Word processing is provided by the PIE 1.5 full screen text editor and the TEXT text formatter. PIE allows 24 function key commands and cursor motion keys that allow editing anywhere on the screen.

The C/80 C Compiler implements a large subset of the C programming language and includes a run-time I/O library. Also available are Z-80 and 8080 op-code versions of the UVMAC macro assembler, the REACH modem and File Transfer program, the PACK file compressor and CRYPT file encryptor.

This software (priced from $20–$40) runs on the H89, Z89 and H8 (with H19) computers under the HDOS operating system in 32K. Reader Service number 498.

kilobaud
MICROCOMPUTING
BINDERS
order yours today



Keep your library of Microcomputing safe from loss or damage in these handsomely appointed binders with rich dark blue covers and gold lettering. Each binder holds 12 issues making an EXCELLENT REFERENCE HANDBOOK. Several binders form a quality library you can be proud of. Please state years 1977-81.

$7.50 each . . . 3 for $21.75 . . . 6 for $42.00
Postage paid in USA. Foreign orders please include $2.50 for postage.

Send check or money order only to:
KILOBAUD MICROCOMPUTING BINDERS
P.O. Box 5120, Phila., PA 19141

Allow 6-8 weeks for delivery. Please no C.O.D. orders, no phone orders.

Apple II Bowling League Program

The Bowling Data System is a new Apple II program for managing bowling league data and is designed for leagues of up to 40 teams with up to six bowlers per team. A cumulative record is kept of total pins, games won and lost, total points and high series for each team and for each bowler, as well as high game, handicap and other data.

Weekly scores for each bowler are entered from score sheets provided by the system, which then prints a weekly recap report and the score sheets to be used for the following week, automatically generating team and lane pairings. A season average report also is produced by the system, listing all bowlers in the league in descending order by average. The system will run on an Apple II with 32K of RAM, Applesoft in ROM, one disk drive and an 80-column printer. Disk price is $79.95.

Rainbow Computing, Inc., 9719 Reseda Blvd., Northridge, CA 91324. Reader Service number 486.

Apple School Administration Program

The Assistant Principal is a complete administrative package for high schools and junior high schools. The package provides total control of class rosters, student master records, student schedules, teacher assignments and grade reporting. The system allows the school administrator to design student input documents, enter students onto the system, schedule their classes, print class rosters, accept grades and test scores, print report cards, print file folder labels and prepare student master records. It automatically prints ranked class lists and records attendance information.

The system requires two disk drives and Applesoft in ROM and is provided on seven diskettes for $500.

Monument Computer Service, Village Data Center, PO Box 603, Joshua Tree, CA 92284. Reader Service number 497.

COMPUTER CLINIC

Wanted: OEMs Assembly programmers Stock market and TRS-80 programs

I am preparing for publication a handbook for assembly-language programmers, consisting primarily of quick-reference charts and tables and universal programming tricks. I would appreciate suggestions as to material that assembly programmers would find useful.

Robert Ross
2205 Grayson Place
Falls Church, VA 22043

My company wants to talk to several firms who can assemble those powerful boards advertised in *Kilobaud Microcomputing* into a computer capable of supporting hard disk storage and a number (2-20) of TRS-80 microcomputers in an interactive mode. We would require two to four such systems per month, assuming we can find a knowledgeable OEM to assist us.

G. William Carlson
Automated Medical Systems Inc.
One Buttonwood Square, Suite 205
Philadelphia, PA 19130

As an early retiree who has done well in speculation through the systems approach, I am interested in contacting computerists who are doing advanced forecasting on both stock and commodity markets.

Ted Broder
Box 407
Flushing, NY 11363

As the owner of a 32K (soon to be 48K) TRS-80 Level II and a Pertec TFD-200 77-track disk drive, I am looking for the following programs:
a capital equipment inventory control program
a general inventory program
a word processor for business communication
a preventative maintenance scheduling control program
a database to record maintenance and service information

These programs would have to run under TRS-DOS or on my TRS-80 Level II under Pertec Microdos or under NEWDOS/80.

J. Lehner, c/o SPA
Apt. 191, El Tigre
Edo. Anzoategui
Venezuela

PRINTERS

MICROTEK MT-80
—S LIST $895 OUR PRICE $775
—P LIST $795 OUR PRICE $685

OKIDATA MT-80
LIST $800 OUR PRICE $650

BASE$_2$ MODEL 800B
LIST $699 OUR PRICE $575

PLEASE ADD 3% FOR S&H TO ORDER

TECHNICAL INNOVATIONS
P.O. BOX 803 DEPT. K
HILLSBORO, OR 97123
503-648-6423
✓53

If YOU OWN AN OSI C2 or C4,
NEVER WONDER ABOUT TAXES AGAIN
ORDER OUR 1980
TAX ESTIMATES (1040) PROGRAM (8K).
Tax tables written into program. Just input the figures and program displays taxes due or refund. Even computes carry-forward cap. gains or losses. Excellent year-round spot-check tax program. $19.95
Updated annually at slight additional cost.
OTHER OSI C2/C4 8K PROGRAMS:
STOCK CHARTING. Let your computer draw your charts. Displays daily highs, lows, closes and volume. $15.95
PERSONAL FINANCE PACKAGE. 4 programs — tax info. file, budgeting, mileage and current income/payables. $17.95
UNDERSTANDING FINANCIAL STATEMENTS. Four 8-K programs. Great tutorial for intro. to financial statements. $24.95
Add $1.50 for shipping. Add $4 for disk.
Excellent royalties on accepted OSI (8K) programs.
BAP$ SOFTWARE ✓166
6221 Richmond Ave; Suite 220
Houston, Tx. 77057

OHIO SCIENTIFIC
USERS!
Read....
PEEK (65)
The Unofficial Users Journal
☐ Software Exchange
☐ Hardware Mods
☐ Peeks & Pokes
☐ Bugs & Fixes
Send $12 for 12 issues to:
PEEK(65) ✓98
P.O. Box 347
Owings Mills, MD 21117
Maryland Subscribers add 5% sales tax
Foreign Subscribers add $8 postage
Check reader preference card for free issue

HEATH-ZENITH
H8-H89-Z89
AT LAST !
PROFESSIONAL QUALITY
Business and Educational Software is now available for the powerful Heath and Zenith computer systems.
Experience and Professionalism are the hallmarks of XtraSoft and are reflected by the products we sell.
For our current catalog contact:

✓200
Xtra Soft
PROFESSIONAL SOFTWARE DEVELOPMENT
P.O. Box 91063
Louisville, KY 40291
HEATH & ZENITH Are Registered TM's OF HEATH & ZENITH CORP's



✓Reader Service—see page 226

BOOK REVIEWS

Videotext: The Coming Revolution
Home Computers Can Make You Rich
8085A Cookbook
How to Program Microcomputers

Videotext: The Coming Revolution in Home/Office Information Retrieval
Efrem Sigel, ed.
White Plains, NY: Knowledge Industry Publications, Inc.
Hardcover, 154 pp., $24.95

"In times of chaos, one should always get there first."—Dr. Christine Urban, president of Urban and Associates, at the 125th sales conference of the International Newspaper Advertising Executives last July.

* * * * *

The American communications industry is finally waking up to the fact that electronic information systems are here, and the scene looks like a D. W. Griffith version of the California gold rush. Across the country, corporations of all shapes, sizes and concerns are slavering over the cable stations, teletext systems and computer networks that sparkle in the sun like naked veins of rich, ripe ore. From giant monoliths like Dow Jones and CBS to little operations like the Ottumwa (Iowa) *Courier*, everybody wants to stake a claim.

In view of such volatility and flux, a book on videotext seems like folly. The medium of print is simply too slow to capture the rapid advances being made in the field. Not even the major microcomputing magazines can keep up—the best they can do is keep track.

But remarkably, the authors of *Videotext* have avoided this pitfall. In fact, they have turned a potential weakness into a strength. By concentrating on the history and development of videotext, and by offering an even-tempered discussion of videotext's potentials, Sigel and his friends have managed to step above the fracas and give it some perspective.

The book concentrates mostly on the British systems. This makes sense, for, as Colin McIntyre points out in his article on the CEEFAX teletext service, Britain got a good two years' jump on the rest of the world. The Britons have developed a faculty that comes only with time: hindsight.

The two major systems in Britain (at least, at the time this book was written) are CEEFAX and Prestel, the latter the Post Office's viewdata system. CEEFAX, a service of the British Broadcasting Corporation and therefore publicly owned, went on line in 1976 after a two-year pilot trial. It is a standard, one-way teletext service; that is, a staff of editors and writers keeps a computer full of information on various subjects, while at home the viewer uses a keypad to call it up on his TV screen. Categories include news, finance, sports, food, entertainment, weather and so on.

Prestel, in operation since 1979, is similar to The Source or CompuServe in the U.S. The user retrieves information via the telephone lines, connecting his terminal to the phone with a modem. At present, says Max Wilkenson in his piece on Prestel, subscribers use a simple numerical keypad to call up various items on a menu; he mentions, however, that alphanumeric keyboards and intelligent terminals are in the future.

The authors spend a great deal of time explaining and comparing the potentials, problems and advantages of the two forms of videotext. This is the book's strength; it lays out the facts for its readers without favoring one system over the other. The author's observations can be summed up thusly:

- Teletext systems are far less expensive to set up than viewdata, since they use existing television broadcast signals. CEEFAX, says McIntyre, cost only $200,000 to put on the air, and can be maintained by the BBC for only $200,000 of its annual $300 million budget. This comes to a few pennies per viewer. (Funds are generated by a Broadcast Receiving License each set owner must have.) The Post Office, in contrast, has spent millions on Prestel, and users must pay an hourly charge for the service.

- Prestel offers its subscribers far more information than CEEFAX. "Broadcast teletext should satisfy those who want relatively small quantities of frequently changing information: news, weather, travel, share-prices, sports results," says McIntyre. "For those who want more specialized information for a particular purpose, and want it treated in depth, Prestel is their service."

- To get the most out of viewdata, a user should have, or plan to get, a microcomputer. While micros are rapidly falling within the range of the average person's financial and technical resources, they are far from becoming standard home appliances. Teletext, on the other hand, uses the TV, something nearly every home has at least one of. Telephone availability is a related problem; people who use a viewdata service extensively will need a second phone.

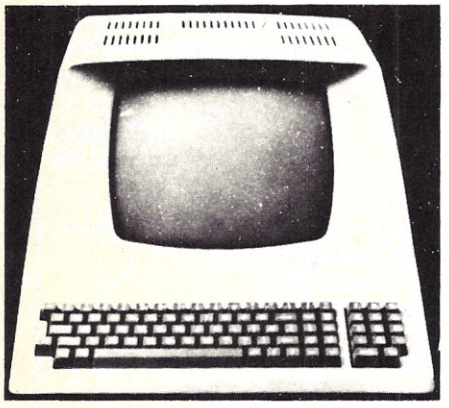
- Both teletext and viewdata must overcome the ingrained attitudes consumers have toward their TV sets. To date, television has been a passive medium, used mostly for entertainment and leisure. Public television has been running up against this problem for years, and there is no reason to believe that videotext will have an easier time of it.

"The real question comes down to consumer need for the service," says Sigel in the concluding chapter. "Obviously there are some individuals addicted to news or financial reports, who absolutely must be plugged into a device that feeds them the latest information. But how many are there, and in what way are they willing to support the service by paying for it?"

Sigel goes on to point out that videotext is not the only new technological wonder available to consumers; it will have to compete with such products as vidco games and video cassette recorder/players. "Consumers do not want, nor can they afford, every possible gadget," Sigel observes. "They will pick and choose. The choice of a video recorder may mean the rejection of a videotext decoder—not consciously, but because the individual is going to spend his time watching old movies or tennis lessons on the tube, not

Terminals and Printers!

TELEVIDEO TVI-912C



Upper and lower case, 15 baud rates: 75 to 19,000 baud, dual intensity, 24 x 80 character display, 12 x 10 resolution. Numeric pad. Programmable reversible video, auxiliary port, self-test mode, protect mode, block mode, tabbing, addressable cursor. Microprocessor controlled, programmable underline, line and character insert/delete. "C" version features typewriter-style keyboard. List $950

OUR PRICE: CALL

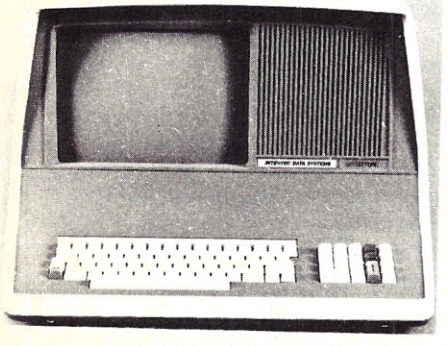
920C (with 11 function keys, 6 edit keys and 2 transmission mode keys, List $1030

CALL

Intertec EMULATOR

Software compatible with a Soroc IQ-120, Hazeltine 1500, ADM-3A or DEC VT-52. Features block mode transmission and printer port; 12" anti-glare screen; 18-key numeric keypad; full cursor control. List $895

OUR PRICE $749



NEW INTERTUBE III

List $995 **ONLY $749**

12" display, 24 x 80 format, 18-key numeric keypad, 128 upper/lower case ASCII characters. Reverse video, blinking, complete cursor addressing and control. Special user-defined control function keys, protected and unprotected fields. Line insert/delete and character insert/delete editing, eleven special line drawing symbols.

SOROC



IQ-120
List $995
SPECIAL $729

IQ-140 List $1495
SPECIAL $1149

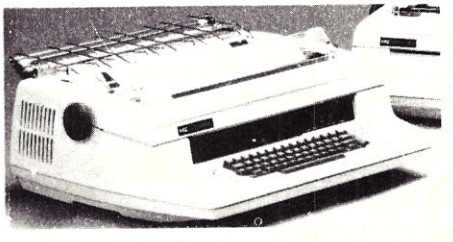
HAZELTINE



1500
ONLY $879

1410 w/numeric keypad, List $900 . . . . . **$749**
1420 w/lower case and numeric pad **849**
1510, List $1395 . . . . . **1089**
1520, List $1650 . . . . . **1389**

NEC SPINWRITER™

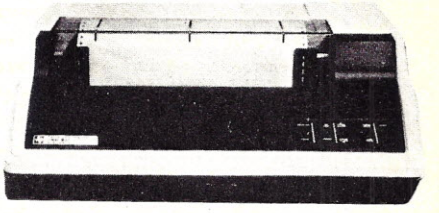


Terminal/Keyboard as well as RO Printer Only models available.
CALL FOR PRICES!

CENTRONICS PRINTERS

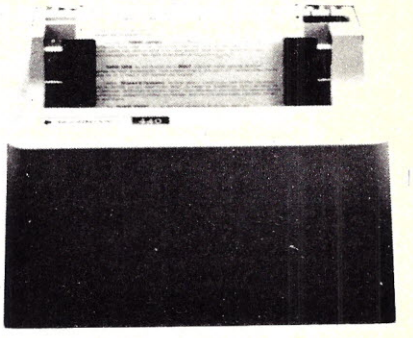
NEW 730, parallel, friction, tractor . . . **$649**
NEW 737 parallel, friction, tractor **$829**
779-2 w/tractor (same as TRS-80 Line Printer I), List $1350 . . . . . **NEW**
702 120 cps, bi-direct., tractor, VFU . . . . **LOW**
703 185 cps, bi-direct., tractor, VFU . . . . **PRICES**
704 RS232 serial version of 703, $2350 . .

TI-810



TI-810 Basic Unit, $1895 . **ONLY $1695**
TI-810 w/full ASCII (Lower case), vertical forms control, and compressed print . **$1895**
TI-745 Complete printing terminal with acoustic coupler, List $1695 . . . . **$1399**

PAPER TIGER®



IDS-440 Paper Tiger, List $995 . **$695**
w/graphics option, incl. buffer, $1194 . . **$789**
TRS-80 cable **45**
NEW IDS PAPERTIGER 460 List $1295 . **$1149**
NEW IDS PAPERTIGER 460G List $1394 **$1199**

NEW IDS 460
QUALITY PRINTING AT MATRIX SPEED—LOGIC SEEKING PROPORTIONAL SPACING
w/auto text justification

ANADEX
DP9500/DP9501 PRINTERS

DP-9500, List $1650 . . . . . **$1399**
DP-9501, List $1650 . . . . . **$1399**

OKIDATA Microline 80 **ONLY $649**
Tractor Feed Option **$99**
Serial interface **$89**
AXIOM IMP I **$699**
COMPRINT 912 w/parallel interf. **$559**
912 w/serial interface, List $699 . . . . . **$589**
MICROTEK, List $750 . . . . . **$675**
ANADEX 80-Col. Dot Matrix. **$849**

Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are f.o.b. shipping point. Prices are subject to change and offers subject to withdrawal without notice. **WRITE FOR FREE CATALOG.**

50

MiniMicroMart, Inc.

1618 James Street, Syracuse NY 13203 (315) 422-4467 TWX 710-541-0431

VISA
master charge

scanning news bulletins."

Such questions are important these days, at a time when too many people are adopting an unabashed "gee whiz" attitude and painting scenarios for the future that look like something out of the Jetsons. If only Sigel and his colleagues had probed a little further. For instance, what about the actual substance of videotext's offerings—are we simply developing a new form for the same content? Videotext offers more information at greater speeds, but is this what modern man needs when he can't even efficiently process the information he's swamped with now?

And how will videotext affect the social and economic classes of our society? The ghetto-bound, the rural poor and other minorities are not likely to be waiting in line to buy their modems, microcomputers and the like. If knowledge is power, videotext could well increase the gaps between the rich and the poor, the informed and the uneducated.

But this book is probably not the place for such weighty questions. It is enough that *Videotext* provides such an intelligent and self-contained overview of the subject; conjectures on the social ramifications of electronic communications would only have diverted the authors from their intents.

In addition to its sections on CEEFAX and Prestel, *Videotext* includes chapters on videotext in the U.S. and in the rest of the world (the rest of the world in this case comprising Canada, France, Japan, W. Germany, Holland and Scandinavia). While they help to provide a context for developments in Britain, these portions of the book are comparatively outdated and incomplete. The chapter on the U.S., for example, gives only a cursory survey of such systems as Warner's QUBE, Knight-Ridder's Florida experiment and The Source. It makes no mention of CompuServe, and was published too early to catch such events as this country's first electronic newspaper (The Columbus [Ohio] *Dispatch*).

But these inadequacies are not the fault of the authors. It will be a few years before anyone produces a definitive study of videotext. The field is too vibrant to be yet enclosed in a block of plastic, like a ball bearing, and made into a paperweight. In the meantime, *Videotext* serves as a solid introduction, one that will have value for some time to come.

Eric Maloney
***Microcomputing* staff**

Home Computers Can Make You Rich
Joe Weisbecker
Hayden Book Company, Inc.
Rochelle Park, NJ, 1980
Softbound, 128 pp., $5.95

I'm very cynical about get-rich-quick schemes, so I'm usually negative about books such as this one. How many people actually strike it rich after reading how it should be done? I decided long ago that, unless I was incredibly lucky, the only way I was going to get rich—or even earn a comfortable living—was through hard work, and lots of it.

Neither computers nor Joe Weisbecker's book will make you rich. But you have to have something to work with, and Weisbecker has come up with more good ideas than any other author that I've read yet.

This is a book of ideas—an enormous number of ideas. Sell software; sell hardware; do consulting; write articles or books; provide computer services; invent gadgets, interfaces or games—the list goes on and on. He discusses both spare-time and full-time activities. You get the feeling that Weisbecker has successfully tried many of these ideas himself.

At first I felt that he was just skimming along with too many generalizations and not enough specifics. But after awhile I began to realize that there wasn't an idea here that would be used in its entirety or exactly as presented anyway.

Weisbecker gives quite a bit of background on microcomputer hardware and software, dwelling mainly on the inexpensive models such as the KIM, VIP, PET and TRS-80. A person using a computer for serious business purposes is going to want something a little more versatile and sophisticated, but these simple machines are probably a good place for the novice to start.

It rankles me a bit when someone says, as Weisbecker does, that the S-100 bus is obsolete. I contend that it will have a long, vigorous life until someone comes up with something better—and no one has yet. Each new machine on the market, with its new bus that is totally incompatible with all of the previous microcomputers, only increases the cost and complexity of hardware and software. I'll stick with the S-100.

Some of the ideas presented are pretty far-out, but still worth considering. A computer clown for kids' parties? Computer-generated art objects? Show business schemes? And that's only the beginning.

One chapter deals with putting your money to work and is worth reading two or three times. It applies to any money, not just that earned in a computer-oriented business. It doesn't take much mathematical ability to figure out that money in a savings account is shrinking instead of growing because of inflation. But what to do about it? Investing is the answer, and Joe has some suggestions that might help you increase your income, or at least get your thinking pointed in the right direction. Stock market management is one such concept, but there are many more.

When I finish a book, I always ask myself the following question: "Given the price of the book and the material that it contains, can I recommend it as a good buy?" If any one of the hundreds of ideas in *Home Computers Can Make You Rich* earn you as little as $60, you'll have the cost of the book back ten times over.

Should you buy it? If it is your intention to use your microcomputer for anything other than playing games for your own amusement, the answer is "Yes!" If you don't now own a computer, this book might just convince you to rush out and get one.

Rod Hallen
Washington, DC

8085A Cookbook
Titus, Larsen, Titus
Howard W. Sams & Co., Inc.
Indianapolis, IN, 1980
Softcover, 350 pp., $12.95

Designing and building your own microcomputer can be a rewarding experience. But it can also be a frustrating one, particularly when you don't have the slightest idea what you're doing.

The main problem is that, until recently, little has been published on microcomputer design. And what has been printed could only be understood by advanced computer engineers.

This is fortunately changing. The *8085A Cookbook* is one recent attempt to bring microcomputer design down to the hobbyist level.

The authors (known to most as The Blacksburg Group) are well-known for their other books, which discuss various microcomputer topics in a down-to-earth style that is both enriching and easily understood. The *8085A Cookbook* is no exception. Armed with only a basic knowledge of digital electronics (e.g., gates, flip-flops and decoders), the reader can successfully design and build a microcomputer around the 8085A microprocessor.

The book starts off with a discussion of the basic concepts and elements of a microcomputer, such as programming, memory and I/O (input/output). Also included is a detailed description of the 8085A microprocessor, covering its internal architecture, power requirements, control signals, timing and instruction set.

Chapter 2, entitled "Basic System Control," is on the various support circuitry required by the 8085A. It deals individually with such circuits as the clock and control signal decoder, and shows a number of approaches to their design.

The next three chapters concern the design of memory systems. The authors present the basic elements of both static RAM and ROM memory systems, along with the logic circuits needed to make them work. Topics covered include address decoders, read/write signals, access times and data bus buffering. In their designs, the authors use such com-

mon memory ICs as the 2102 and 2114 RAM chips and the 2708 ROM chip, making memory design much easier for the reader.

Chapter 6 contains information on microcomputer interfacing. Here the reader is exposed to I/O operations, I/O ports, USARTs, interrupts and several complex ICs such as the 8255A programmable peripheral interface chip.

Chapter 7 introduces the reader to a number of 8085A family integrated circuits that single-handedly perform tasks that would normally require a number of ICs. This chapter describes the functions provided by each chip and how they are interfaced to the 8085, as well as the advantages and disadvantages associated with each chip.

Chapter 8 ties the previous chapters together in such a way that the reader can actually design and build a completely operational 8085A-based microcomputer. In fact, it includes a complete schematic and parts source for a small trainer computer.

Concluding the book are an 8085A instruction set summary and a profusion of data sheets.

One of this book's qualities is that the authors took the time to explain *why* they chose to use a particular design or IC and the effects of doing it differently. Thus, the *8085A Cookbook* (particularly chapters 3, 4 and 5) should be useful to anyone interested in microcomputer design. I own an 1802-based system and have applied much of what I learned from this book to my computer.

But like most books, the *8085A Cookbook* isn't perfect. For it to truly be a cookbook, one or two chapters should be devoted to software. Instead, the authors refer you to another one of their books, *8085 Software Design* (which, I might add, is well worth having). As it stands now, the reader will be able to build an operational computer, but may or may not have the slightest idea how to program it!

Another improvement would be to include some material on I/O devices—at the very least a hex keypad and an LED readout.

Despite these shortcomings, the book is still well worth having and should prove valuable to any hobbyist who is interested in building or expanding his own computer system, whether it be 8085-based or not.

Steve Dominguez
Golden, CO

How to Program Microcomputers
William Barden, Jr.
Howard W. Sams & Co., Inc.
Indianapolis, IN, 1979
Softcover, 256 pp.

This book deals with the programming of not one, but three of the most popular microprocessors: the 8080, the 6800 and the 6502. It is divided into four sections: Basic Concepts, Microcomputer Architecture and Operation, Assembly Language Programming with Microcomputers and Programming Algorithms. In addition, three appendices list the instruction sets for the three microprocessors.

Basic Concepts includes information on binary and other number systems, arithmetic operations and basic computer operations. The entire section is rudimentary and can be skipped by all but the novice programmer.

Section two tries to cover subjects of more general interest. Six chapters cover microprocessor architecture, addressing modes, memory and stack operations, instruction sets, input/output operations and interrupt processing. The author compares each of the three microprocessors in each treatment of these subjects; when you consider that all six chapters total 38 pages, you get an idea of how lightly each concept is presented.

The third section discusses actual programming and coding techniques. Subjects covered are hand assembly techniques, integer math with multiple precision schemes, subroutines, branching, loops and stack operations. Other chapters cover such concepts as table operations, list processing, decimal and floating point math and input/output drivers. Barden gives examples of each concept for each of the three microprocessors.

The fourth part of the book is simply a collection of subroutines listed in assembly language along with machine codes. Each subroutine is repeated for the 8080, the 6800 and the 6502. They include a double precision shift, a timing routine, single precision multiply and divide routines, multiple precision add and subtract routines, some code conversions (ASCII hex to binary and vice versa, for example), a data fill, a data block move, a string compare, a table search and a random number generator.

This book fills a definite need if you are considering upgrading or switching your present system to one using a different microprocessor. The comparisons made between the three microprocessors and their basic operations can be invaluable in aiding your decision.

It should also prove convenient to anyone who is considering writing a simulator program (for running 8080 programs on a 6800, for example). In fact, in various portions of the book, the author hints how such a program can be implemented.

I don't recommend this book to anyone unfamiliar with machine-language programming; the topics are not covered with enough depth. Therefore, the novice programmer who wants to learn hand assembly techniques will have little success with this book.

Thomas Franks
Wadsworth, OH

PERSPECTIVES

Conclusion

We are using our computers every day in many ways for business, in sales, in research and in manufacturing. Five senior executives have units assigned at home as well as in the office. These have RS-232 boards and acoustic couplers. Besides being usable as business terminals to talk to our big computer at night, they can access MicroNet, The Source and Lockheed's Dialog. And they can be used as word processors or computers to work on those late-night brainstorms.

Several other members of the staff have bought their own TRS-80s for home use. But most staff members trade off and take turns bringing their office TRS-80s home on weekends. Although we have two full-time programmers for our TRS-80s (and some added help from our two programmers for our big computer), nearly one third of all programs are being written by the staff at home on their own time.

So I can only say that the computer bug is catching, even if we businessmen are working on business and scientific programs!■

SUPERIOR SOFTWARE PACKAGES FOR THE DISK BASED **TRS-80***

SMARTTERM •$79.95

UNQUESTIONABLY THE BEST SMART TERMINAL PACKAGE FOR THE TRS-80

- •True Break Key
- •Auto Repeat (Typomatic) keys
- •Programmable 'soft' keys
- •Forward/Reverse Scrolling Multipage Display
- •Transmit from Disk File, Screen or Buffer
- •Receive to Disk File, Buffer or printer
- •Multi Protocol Capability

SPOOL-80 • $39.95

A TRUE DISK-TO-PRINT DESPOOLER FOR THE TRS-80

- •Print Disk Files While Running Other Programs
- •Prints Compressed Basic Files
- •Includes RS-232 Driver for Serial Printers

CALL US FOR YOUR CUSTOM SOFTWARE REQUIREMENTS ✓253

MICRON, INC.
10045 Waterford Drive
Ellicott City, MD 21043
(301) 461-2721

Model II Versions Available Soon

*TRS-80 is a Trademark of Tandy Corp.

✓Reader Service—see page 226

By Henry Lee

I Love My TRS-80s– All 35 of Them

The publisher of *Microcomputing* has thrown down the gauntlet—and someone must respond.

In the March 1980 issue of *Microcomputing Industry*, Wayne Green raised the question of whether microcomputers are really used in business. By the term microcomputers he meant TRS-80s, since over 150,000 TRS-80 Model I's have been sold–more than all other brands put together.

He based this comment on several observations:

- Business software offered by the microcomputer manufacturers is of poor quality.
- Business software sold by independent software houses does not sell nearly as well as games.
- There are very few reviews of business software in the microcomputer magazines.

While I don't necessarily refute Mr. Green's comments, as a businessman-scientist I'd like to cast some light on the subject. I have purchased and supervised the installation of 35 TRS-80 Model I Level II 48K two-disk computers in my company, and I believe I can help answer his questions.

Manufacturers' Software

First, I agree that the software available from manufacturers is not too good. This is true in both the micro and minicomputer business.

We have 11 minicomputers in our company, ranging in size up to 300 megabytes, and 20 terminals. The software support from the manufacturers is no better than the support we get from the microcomputer manufacturers. Most manufacturers of business computers tend to divorce themselves from the software and leave it to the owners to hire their own programming. While some concerns are now offering a type of turnkey service, this is the exception.

The programs that the microcomputer manufacturers do supply are so-so. They are generally not in machine language, and hence run slow. They are not fully thought through.

One business mailing list program, for example, is pretty fair, if you don't mind a seven-hour sort, which can be done overnight. But the print commands print only one label across at a time, and most business mailings are done with labels mounted three across.

Also, the program does not seem to allow for the occasional five-line address, which messes up the register on the labels.

So the user has to end up going into the program and doing extensive reworking. This can be almost as costly as writing the program from scratch, and the user often still has a program inadequate for his particular needs.

Independent Software Houses

The business programs from the independent software houses also suffer from inadequacy. They are written by programmers—very capable programmers—but they usually guess what the businessman wants. Even if they do have a businessman help with the specifications, they are faced with the infinitely varied demands of businessmen for differing reports.

I once thought that we should compromise on programming and use the canned programs. But as I got into computers I found it was a mistake to make your computer function with one hand tied behind its back, which is what you're doing if you don't let these powerful machines give you exactly what you want.

Despite the above shortcomings, I buy about one copy of every independent business program written, just to get ideas for our own programming work. What is $50 or $100 for a commercial program if you expect to spend $1000 to spec and write and debug your own program? A commercial program often gives some rather good suggestions, even if the program, per se, does not meet your business needs.

It is beyond the scope of this article to write about the magnificent utility programs written by some independent software houses. These are intended for the mass hobbyist and business markets, and they are often useful to at least a few people in the company. These programs include NewDOS+ (Apparat), Electric Pencil (Michael Shrayer), Textwriter (Organic Software), Penpatch (Mumford) and Smart Terminal (Softside), to say nothing of Harvard Pennington's book *TRS-80 Disk and Other Mysteries*.

On the other hand, I'm now studying six database management systems for possible use. These newer, user-definable programs may have advantages over self-written programs, and are undoubtedly a big step forward. In this sense, these programs seem as good as ones I have been offered for our bigger computers. But I find that it takes quite a bit of study to learn someone else's program, compared to one for which I have written the specifications and have had a hand in writing and formatting. So I'm not sure that even these newer programs are an answer to the business software problem.

We have had good experience with the Analysis Pad from The Bottom Shelf. On the other hand, we have written three other programs for columnar material because we needed special chemical calculations to be built into the program.

Reviews of Business Software

Why are there no reviews of business software?

First, if the commercially available programs are not very good, why bother to review them? Second, most businessmen are too busy to take the time to write an article. Third, we are writing our own unique programs to meet our own unique needs, so what is there to write about?

(continued on page 241)

Dr. Henry Lee is president and chief scientist of Lee Pharmaceuticals, a manufacturer of polymeric biomedical products. His address is 3543 E. California Blvd., Pasadena, CA 91107.

New muscle for Heathkit Computers

Now with new CP/M® Systems Software for thousands more programs...and new 8-inch disk system for millions more bytes.



The Heathkit All-In-One Computer now has space for 64K of addressable RAM, so you can run bigger, more complex programs.

And our new CP/M® Operating System (Standard ORG-0, Version 2.2) makes thousands of CP/M programs available to you. Heathkit systems can run more, do more, store more than ever before.

A new 8-inch double-sided, double-density disk system, with over 1 million bytes per drive, is now available for Heathkit H-89 and H-8 Computers.

The new 8-inch disk system features soft-sectored disks for IBM® compatibility. It's capable of operating in standard IBM 3740 format. And the 8-inch system can be used in conjunction with 5¼-inch systems. **For compatibility with the rest of the industry, Heathkit Computers may just be the most flexible systems you can buy.**

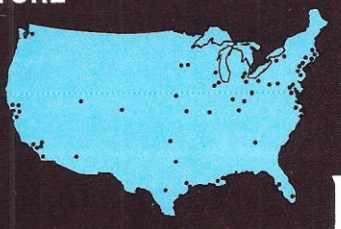
All Heathkit computers and peripherals are available in money-saving, easy-to-build kit form — or completely assembled and factory tested. All are supported by the best documentation in the business and by 62 service centers throughout the U.S. and Canada. You're never out in the cold.

For complete details and prices on Heathkit computers, peripherals and software, write today for the latest Heathkit Catalog or visit your nearby Heathkit Electronic Center*.

VISIT YOUR HEATHKIT STORE

Heathkit products are displayed, sold and serviced at Heathkit Electronic Centers*, located in major cities throughout the U.S. and Canada. See your white pages for the store nearest you.

*Units of Veritechnology Electronics Corporation, in the U.S.





Send for FREE catalog

Write to Heath Company, Dept. 351-734, Benton Harbor, MI 49022

In Canada, contact Heath Co., 1480 Dundas St. E., Mississauga, Ontario L4X 2R7

Heathkit®

236

IBM is a registered trademark of International Business Machines Corporation. CP/M is a trademark of Digital Research, Inc.

The home computer you thought was years away is here.



C8P DF

Ohio Scientific's top of the line personal computer, the C8P DF. This system incorporates the most advanced technology now available in standard configurations and add-on options. The C8P DF has full capabilities as a personal computer, a small business computer, a home monitoring security system and an advanced process controller.

Personal Computer Features

The C8P DF features ultra-fast program execution. The standard model is twice as fast as other personal computers such as the Apple II and PET. The computer system is available with a GT option which nearly doubles the speed again, making it comparable to high end mini-computer systems. High speed execution makes elaborate video animation possible as well as other I/O functions which until now, have not been possible. The C8P DF features Ohio Scientific's 32 x 64 character display with graphics and gaming elements for an effective resolution of 256 x 512 points and up to 16 colors. Other features for personal use include a programmable tone generator from 200 to 20KHz and an 8 bit companding digital to analog converter for music and voice output, 2-8 axis joystick interfaces, and 2-10 key pad interfaces. Hundreds of personal applications, games and educational software packages are currently available for use with the C8P DF.

Business Applications

The C8P DF utilizes full size 8" floppy disks and is compatible with Ohio Scientific's advanced small business operating system, OS-65U and two types of information management systems, OS-MDMS and OS-DMS. The computer system comes standard with a high-speed printer interface and a modem interface. It features a full 53-key ASCII keyboard as well as 2048 character display with upper and lower case for business and word processing applications.

Home Control

The C8P DF has the most advanced home monitoring and control capabilities ever offered in a computer system. It incorporates a real time clock and a unique FOREGROUND/BACKGROUND operating system which allows the computer to function with normal BASIC programs at the same time it is monitoring external devices. The C8P DF comes standard with an AC remote control interface which allows it to control a wide range of AC appliances and lights remotely without wiring and an interface for home security systems which monitors fire, intrusion, car theft, water levels and freezer temperature, all without messy wiring. In addition, the C8P DF can accept Ohio Scientific's Votrax voice I/O board and/or Ohio Scientific's new universal telephone interface (UTI). The telephone interface connects the computer to any touch-tone or rotary dial telephone line. The computer system is able to answer calls, initiate calls and communicate via touch-tone signals, voice output or 300 baud modem signals. It can accept and decode touch-tone signals, 300 baud modem signals and record incoming voice messages. These features collectively give the C8P DF capabilities to monitor and control home functions with almost human-like capabilities.

Process Controller

The C8P DF incorporates a real time clock, FOREGROUND/BACKGROUND operation and 16 parallel I/O lines. Additionally a universal accessory BUS connector is accessible at the back of the computer to plug in additional 48 lines of parallel I/O and/or a complete analog signal I/O board with A/D and D/A and multiplexers.

Clearly, the C8P DF beats all existing small computers in conventional specifications plus it has capabilities far beyond any other computer system on the market today.

C8P DF is an 8-slot mainframe class computer with 32K static RAM, dual 8" floppies, and several open slots for expansion.

Prices start at under $3,000.

Computers come with keyboards and floppies where specified. Other equipment shown is optional.

For literature and the name of your local dealer, CALL 1-800-321-6850 TOLL FREE.

OHIO SCIENTIFIC
1333 SOUTH CHILLICOTHE ROAD
AURORA, OH 44202 • (216) 831-5600

✓4